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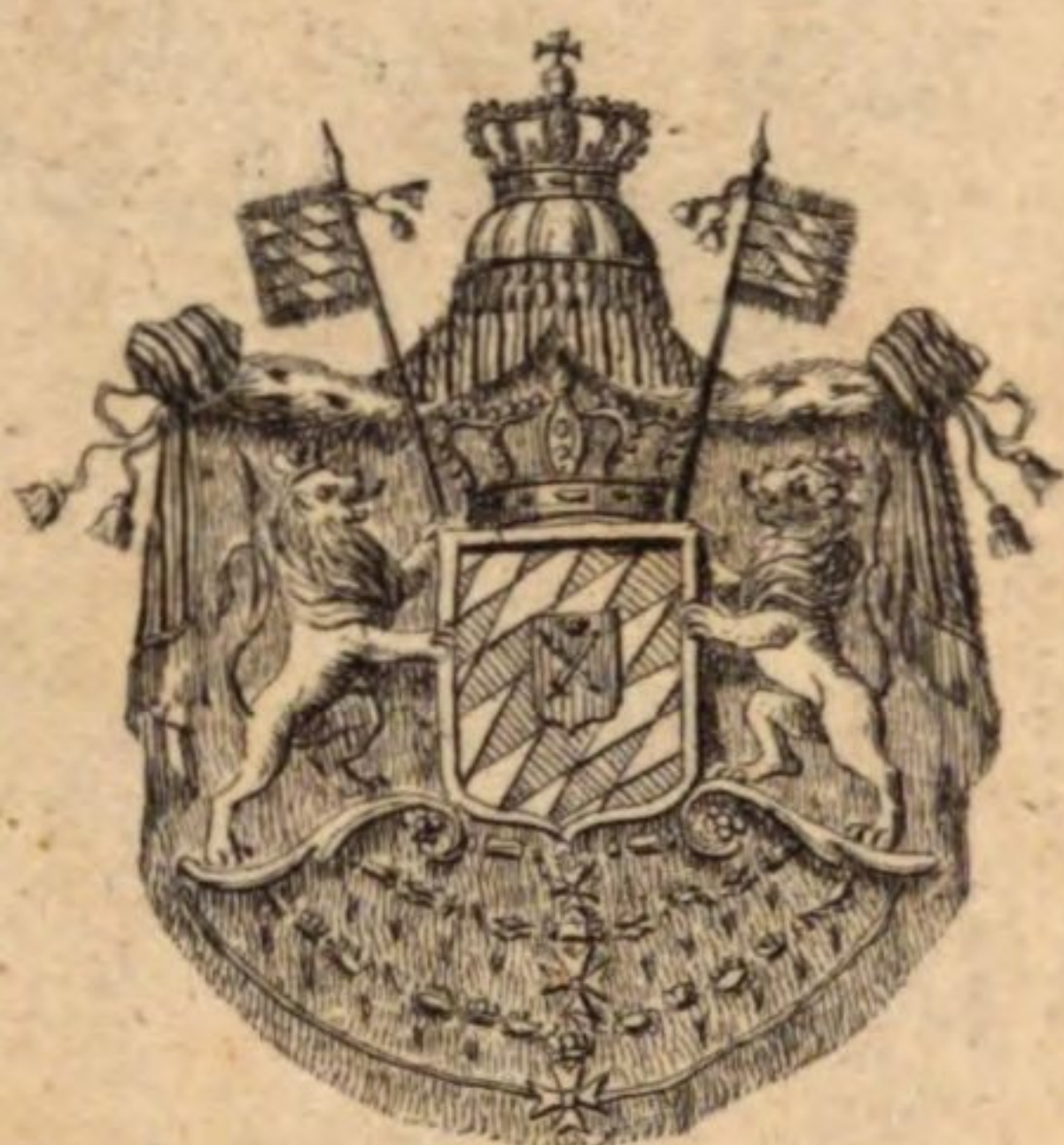
Botanick Essays

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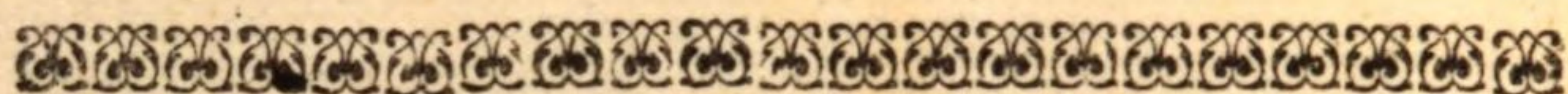
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BOTANICK ESSAYS.

In Two PARTS.

The first containing,
The *Structure* of the *Flowers*, and the *Fru-*
ctification of *Plants*, with their various
Distributions into *Method*:

And the second,
The *Generation* of *Plants*, with their *Sexes*
and Manner of *impregnating* the *Seed*:
Also concerning the *Animalcula in Semine*
Masculino.

Together with
The *Nourishment* of *Plants*, and *Circulation* of the
Sap in all Seasons, *analogous* to that of the *Blood*
in *Animals*.

WITH
Many Curious REMARKS, and several *Discove-*
ries and *Improvements*.

Adorn'd with FIGURES.

Non *fingendum* aut *excogitandum*, sed *inveniendum*,
quod NATURA *faciat* aut *ferat*. BACON.

By PATRICK BLAIR, M. D.
Fellow of the ROYAL SOCIETY.

L O N D O N:

Printed by William and John Innys, Printers to the
ROYAL SOCIETY, at the *Prince's Arms*, the *West*
end of *St. Paul's*. MDCCXX.



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By PATRICK BLAIR, M.D.
Fellow of the Royal Society.
BACON.

Jo. James & Co. Bona

T O
Sir ISAAC NEWTON, K^{nt}.

P R E S I D E N T;

And to the

Council *and* Fellows

O F T H E

ROYAL SOCIETY

F O R T H E

Advancement of Natural Knowledge:

A L S O T O

Sir HANS SLOANE, Bar^t.

P R E S I D E N T;

And to the

Censors and *Fellows* of the Royal College
of P H Y S I C I A N S, *London*.

T H E S E

B O T A N I C K E S S A Y S

Are humbly presented by

Their most humble Servant,

Patrick Blair.

T O
SIR ISAAC NEWTON, K.
P R E S I D E N T ;

And to the
Council and Fellows
O F T H E
R O Y A L S O C I E T Y

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Seniors and Fellows of the Royal College
O F P H Y S I C I A N S , L o n d o n .

T H E S E
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Patrick Blair.



T H E
P R E F A C E.

BEING willing to gratify the ROYAL-SOCIETY, by entertaining them with some Discoveries and Improvements in Botany, I chose the different Sexes of Plants for my Theme. Their favourable Acceptance of my Discourses, and the Entreaty of several of their Learned and Worthy Members, encourag'd me to enlarge upon that Subject, and to compose the following Treatise, which is now published at the Desire, and by the Command of that Honourable and Learned Body.

The considerable Progress of Botany in Britain of late Years, was that which engag'd me the more cheerfully in this Undertaking; for as Dr. Grew was the first who discovered the two Sexes of Plants, and Dr. Morison is own'd by all to be the Restorer, if not Founder of the Method of distributing them secundum Cognationes & Affinitates, which has been since so much improv'd by Mr. Ray; so I resolv'd not to be wanting in

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making some farther Advancements in both, in order to render them more intelligible by the following Essays.

I have divided this Treatise into Two Parts, the one containing what is proper to Plants, and the other what is common to Plants and Animals. By the one I propose to instruct the Botanick Student, and the other is design'd for the Information of such as are more knowing in that Science.

As the Flowers and Fruit of Plants, are chiefly to be considered for their more convenient Distribution into Method, and for the better explaining of their Sexes, and manner of impregnating the Seed, so I have thought fit to treat of them in the two first Essays. In the first, I have describ'd the Parts for Generation in both Sexes; and the second gives an Account of the several Kinds of Fructification. In these I shew, wherein lies the difference betwixt Pistillum and Stylus, Calix and Perianthium, Siliqua and Capsula.

The Third Essay, which treats of the several Methods, is both useful and necessary. For Method has of late Years been so far multiply'd, the Plants so variously dispos'd, and the Authors of the several Distributions have had such Contests and Debates, which ought to be preferr'd; that instead of informing, they have often led their Followers into the Errors they themselves had advanc'd, and encreased Faction and Division in a Science
of

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of it self so very innocent, that they have actually broke out into a Paper and Botanick War; by which an excellent Institution is perverted, and what was intended for its Welfare, is like to become its Ruine. In order to prevent the Mischiefs of such a growing Evil, I have propos'd the following Means of an Accommodation: 1. To treat of the Origine and Progress of Method. 2. To acquaint the Reader with the general Rules laid down for the Establishment of each Method. 3. To examine every one of them briefly, and to enquire into their several Distributions, that I may shew how far each Genus or particular Species have been regularly or irregularly dispos'd, according to their Characteristick or Distinctive Notes: So that in few Sheets the several Methods have been so compar'd with each other, that the Botanick Student may soon be inform'd both of their Failings and Perfections. This has hitherto been much wanted, and has not as yet been attempted by any, except what Mr. Ray himself, and Dillenius have done, for the better Establishment of Mr. Ray's Method. In this I have behav'd so impartially, that I have given a full View of the Advantages, nor have I expos'd the Imperfections of any, beyond what was necessary to clear up the Truth; and I hope it will prove so beneficial, that without turning over the Volumes of the Methods themselves, the in-
quisitive

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quisitive Student may come to have so just an Idea of Method in the general, how such a Plant is plac'd according to the one, and how it ought to be plac'd according to the other, that being diligent he may soon arrive at a most intimate Knowledge in Botany. And for his better Assistance, I have given an Account of what is meant by Method, what a Characteristick and Distinctive Note is, how many of these Notes ought to concur to make up the Character of a Plant; and what is meant by Class, Sect, Genus, Species, &c. according to the several Authors. After that I proceed to the Examination of all the Methods that have been propos'd, from Dr. Morison down to this Time; such as Mr. Ray's, Ammannus, Herman, Rivini, Volkhammer, Tournefort and Knaut. Morison design'd to Class by the Fruit and Seed, and to distinguish by the Flower. Ammannus and Herman are the Improvers of his Method. Mr. Ray Classes by the Fruit, and distinguishes by any other part of the Plant which is most fix'd and unchangeable, whether it be by the Flower, with its Disposition and Number of the Petala, by the Disposition of the Leaf, or by the Root. Rivini Classes by the Flower, Volkhammer chiefly by the Seed; Tournefort by the Flower and Fruit, and Knaut by the Flower, with a little Variation from Rivini and Tournefort. In a word, this Essay is not only calculated for such Methods as have been establish'd

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blish'd already, but also to render whatever Methods shall be propos'd hereafter, more easy and intelligible.

As several have treated of what is contain'd in the Second Part, viz. The Generation and Nutrition of the Plants, so I have endeavour'd to canvass their Writings so, as to add what I think has been wanting, to correct what by proper Experience I find they have advanced amiss, and to make several Discoveries and Improvements upon the whole.

In the Fourth Essay, which treats of the Generation of Plants, I have proceeded in the following manner: 1. I have shewn, that since Almighty God was pleas'd to impose a Necessity of two Sexes upon Animals, the same Necessity appears to be in Plants also. 2. That as no Seed can act within it self, for then it would be Agens & Patiens actu & potentia in Seipsum, as Sennertus well observes, so it is necessary for it to receive some subtile Particles from without, to act upon its gross Substance, and to dispose it Tempore & Loco Opportunis, to chit and vegetate. 3. I have endeavour'd to give some farther Proofs of this Necessity, from some negative Experiments. 4. This Necessity farther appears from the perpetual Presence of the Flowers before the Fruit, without which the Fructification cannot be perfected. 5. I have compar'd the several Parts of the Flowers

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Flowers to those for Generation in Animals, and shewn, that the Farina must contain the Male Seminal Matter; because
1. Though all the other Parts of a Flower may be, and are actually wanting in some Plants, yet the Apices are never wanting.
2. The Apices are always full before the Flower is blown, and they are ready to shed the Dust when it is expanded.
3. The Seeds never begin to swell and augment before the Dust is shed.

In this, as in the former Essay, I trace the Origine and Progress of the Opinion, that Plants as well as Animals, have Male and Female Sexes, from Dr. Grew the Discoverer, down to this present Time; and am glad to find that the ROYAL SOCIETY has so great a Share in the Discovery and Improvement of what is able to give the clearest Light into the Knowledge of the Manner of Fecundation or Impregnation, not in Plants alone, but in Animals also. Dr. Grew it was who first gave the Hint to this Opinion. It has been handsomely and succinctly improv'd by Mr. Ray. Camerarius, (as himself acknowledges) was stirr'd up to make a farther Progress in it by their Writings. Mr. Morland, willing to accommodate the manner of impregnating the Seed in Plants to Mr. Lewenhock's Opinion concerning the Animalcula in Semine Masculino, communicated his Thoughts upon that Subject to the ROYAL SOCIETY, which
Mr.

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Mr. Bradly afterward confirm'd by going into his Opinion, and by proposing of some other Flowers as Evidences to prove his Assertions. Mr. Geoffroy made use of Mr. Morland's Arguments, and Camerarius his Experiments, when he communicated his Opinion to the Royal Academy at Paris, which, by what I understand, Mr. Joisseux does not seem to be averse to, though Mr. Vaillant chuses to dissent from them, and joins Issue with Dr. Grew and Mr. Ray. Beside these, I find Boccone and Dillennius to be also of Dr. Grew's Sentiments.

Having perus'd and narrowly examin'd all these, I find their Opinions to be diametrically opposite to each other, and thus stated. EITHER the Farina falling upon the Pistillum, Vasculum Seminale or Semen, impregnates the Seed by means of certain subtile Particles, which penetrate into the Seed it self, and there actuate upon the gross Particles previously in the Seed-Case or Uterus; OR it is a Congeries of Seminal Plants, one of which MUST enter the Vasculum Seminale, and there become the Semen, as Mr. Morland and his Adherents would have it. To know which of these seem to be most probable, I have with great Pains, and diligent Search, examin'd a great many Flowers this last Season, several of which I have ordered to be delineated, and their Figures to be engraven after the Life, and cannot find the least sign of Probability

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bability for Mr. Morland's Opinion; but every Flower I have observ'd, shews quite the reverse; and if that Maxime hold good, which certainly it do's upon all other Occasions, that Nature is Uniform in all its Operations, and that there cannot be two different Ways of performing one and the same thing, Mr. Morland's Opinion must needs fail. And farther, if it were what he contends for, then the Farina would always be proportionable to the Seed to be fecundated, the contrary of which is evident; for Caprifolium, one of his Examples, and Jallapa, have five Stamina and Apices only to one Seed; and Nicotiana has no more to above an hundred: Papaver has above a quadruple quantity of Stamina, to about half the quantity of Seed. 3. Though there be a plain and open Passage requir'd for the Admission of the Farina, if it is the Seminal Plant, yet there is no such thing requisite for the Effluvia, whose Prevalency is fully demonstrable in other Cases.

This Analogy betwixt Plants and Animals afforded me a good Opportunity of prying into Mr. Lewenhock's Opinion concerning the Animalcula. In the examining of which I find, 1. If the Farina in Substantia cannot enter the Embryones, no more can the Animalcula enter the Ovum Foemineum. 2. No Animal can be produc'd without the Concurrence of two Sexes, so that these Animalcula can only be produc'd by Male and
Female

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Female of their own Species. 3. There would not be so certain a Determination of the Number of the Foetus in certain Animals, if it depended upon one of them getting accidentally into the Ovum. 4. One of these small Animalcula could never infer so vast an Alteration upon the whole Female Body. And 5. The Foetus would not partake so much of the Temper and Passions, &c. of the Female, if it only were produc'd by the Male. These Considerations, will, I hope, give a clearer Idea of the Generation of Animals, than has hitherto been entertain'd.

The fifth and last Essay, contains the manner of Nourishment of the Plants. The want of a due Consideration of this Analogy, has hindred those who well understood the Circulation of the Blood in Animals, from applying so valuable a Discovery to the Sap in Vegetables, by which the several Phænomena concerning the Vegetation of Plants, have hitherto seem'd very difficult to be explain'd; and I hope it will not be disagreeable that I inform the World I have now so far discovered the Circulation of the Sap in Plants, as to render every thing concerning their Nourishment, Growth and Encrease, most plain, obvious and easy to be understood.

I have trac'd the Knowledge of the Folia Seminalia previously in the Seed, before Vegetation, from Josephus de Aromatariis the Discoverer. I have set aside the Philosophical

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phical and Chymical Terms, of Attraction, Suction, Fermentation, Concoction, Digestion, &c. and plac'd the Nourishment upon the simple Footing of the Configuration of the Particles and Pores by which the assimilating Quality of the Ancients will be more easily understood. I proceed to shew, 1. That Plants are fed by the Extremity of the Fibers of the Root, as Animals are by the Mouth. 2. That 'tis by a continual Succession of Nutritive Particles, which enter certain Tubuli at the Root, that the Plant is stretch'd forth and extended; that when they are arriv'd at the Extremity, they cannot all flow out, but most of them must return towards the Root, which re-ascending, perform that which is called Circulation. This I have prov'd, 3. By the different Position of the Branches from the Fibers of the Root; for whereas the one must be the Consequence of the lateral Ascent of the circulating Particles, so the other must proceed from their lateral Descent, because of their Position obliquely downward. I have demonstrated how the Carnous and Parenchymatous Roots in some Plants, and Fruit in others, may have a particular Circulation different from that of the whole Plant, analogous to that in several parts of Animals. I have compar'd the Bark, Wood and Pith of a Tree, to the Skin, Bones and Marrow in Animals, given an Idea of their Perennial and Annual Surface, and made it appear, that

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that they are reciprocally nourished, i. e. when the Annual Surface is nourished and augmented, the Nutritive Particles circulate directly through the Perennial, without contributing towards its Augmentation; when the Annual Surface is decay'd, the Perennial is nourish'd; and when the Tree is stretch'd forth as to its length, it ceases to grow as to its Bigness or Grossness. I have likewise explain'd the reciprocal Motion of the Sap betwixt the Root and Top, for when the Vernal and Autumnal Shoots are push'd forth in the Spring and Autumn, the Fibers of the Root are only Mouths for Reception, and Instruments for conveying of the Sap upward; but when these Shoots have acquir'd their full Length, the Fibers of the Root are stretch'd forth, and the Bark and Wood is augmented, as at the Time of the Winter and Summer Solstices. I have prov'd this Circulation, by the Experiments of the Grafting, Inoculating, and Circumcision, and demonstrated it from the Observation of a stript Jessamine. I have ascrib'd a quite contrary Use to the external Pores and Tubuli of the Plant, and shewn, that Malpighi's Tracheæ, and Dr. Grew's Air-Vessels are for the efflux and not influx of Particles, and demonstratively prov'd an insensible Transpiration in Plants as well as Animals. And lastly, I have prov'd, that no Plant can be nourish'd but by the Earth;

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for though they may live in the Air, and by the Water, yet none of these can be said to nourish them, and have explain'd some Phænomena concerning the Succulent Plants.

I have confirm'd the whole, by having recourse to the parallel, negative Operations in Animals, by some curious Remarks, and practical Observations: To which I shall add a few more in this place, as, 1. That the Preparation of the Nutritive Particles depends upon the Configuration of the Pores, appears from the Viscum, which being nourish'd by
" *the ascent of Particles from the Earth, and*
" *variously prepar'd in their Passage throughout the several Tubuli of the Tree, affords,*
(by the Chymical Analysis,) a greater quantity of active Principles than any other cortical or ligneous Substance in these cold Climates, as has been experimented by the laborious Endeavours of that Learned and Expert Physician Dr. James Douglass, R. S. S. who procur'd a great Quantity of Volatile Salt, Spirit, Foetid or Emphyreumatick Oil, and Phlegm by one Process, and Essential Oil by another: Also a good quantity of fix'd Salt by Combustion, so that we may admire the Sagacity of the Ancients, who being assisted by no such Experiments, were (as it were) by an In-
" *stinct, taught to prescribe it in Cephalick and Epileptick Cases, along with the Parts of Animals, 2. The lateral Tendency of this Sap, when interrupted in its Ascent, analogous to*
that

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that of the Blood at an Amputation, is obvious from an Experiment of Mr Fairchild's (whom I have often mention'd, and to whom I owe all the practical Observations I have advanc'd concerning the Vegetation) He cut the Stalk of a white Lilly from the Root, and topp'd it when it began to flower, and in a short time it push'd forth Bulbos from the sides of the Stalk, which when put to the Ground, sent forth Fibers, and became Roots.

3. He observes, that if a Tree is planted in the Autumn, it ought not to be topp'd until the Spring following, for the Sap circulates more agreeably, when allow'd to ascend directly to the top of the Autumnal Shoot, than when interrupted by the cutting it off at the Planting.

4. Some Years ago he observ'd a Plant of an Hedge hog-Aloe all in a Sweat in the Green-House, and wet as if it had been dip'd in Water; of which he could not understand the Reason till next Day, that he found the Plant was dead. This abundantly confirms what I have said concerning the insensible Transpiration, and the harm that may happen to Plants as well as Animals, from too patent, or too much obstructed Pores, or a Plethora, and too great a Distention of the Vessels; in the like Cases his Method of Cure since is a timely Incision, analogous to Blood-letting in Animals.

My extending the following Treatise to such a Length, is the Reason why I have di-

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verted the Reader so much by a Preface, in which I was resolv'd to inform him previously with what is to be expected; and to shew that I have not trifled over so many Sheets in vain. The frequent Citations have enlarg'd the Bulk of these Essays, and some may be ready to look upon them as mere Plagiarism upon that Account. Though I have made use of the Sentiments of several Authors, yet I have ingenuously confess'd from whence I had my Helps; and though all I have borrowed were remov'd, these Sheets need not fear the Fate of the Daw in the Fable, to be unplum'd and laugh'd at; for if what is contain'd in them were contracted within narrower Bounds, there would still remain several Things of moment that are new, wherewith to exercise the Thoughts of the Curious.

As the ROYAL SOCIETY have been pleas'd to approve of this Undertaking, so I hope it will not be unacceptable to the Royal College of Physicians also; and if other such curious Persons, as are knowing in the Natural History and Botany shall be pleased with them, I shall obtain what I desire. I was once afraid, that the agreeable Science of Botany should be at a Loss by the Death of Mr. Ray and several of his Correspondents, but I am glad to find that it still continues in its former Vigour, under the happy Influence of Sir Hans Sloane, President of the College of Physicians, to whom I have been singularly oblig'd. Dr.
Sherard

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Sherard who had the Civility to afford me the use of what Books I wanted to farther my Design; Dr. Tancred Robinson, and Dr. Dale, all of them Mr. Ray's good Assistants and Contemporaries, yet alive. To whom may be added Mr. James Sherard, well acquainted with the Indigenous British Plants; Mr. Rand, an Ingenious and Expert Botanist, Overseer of Chelsea-Garden, and Mr. Millar his Assistant; Mr. Dandridge, a curious Botanist, and Natural Historian, and famous for his Collection of the Eggs of most of the Indigenous Birds in Britain; The Honourable Lord Colvil, an expert Botanist (and knowing in most of the liberal Sciences) in Scotland; And Mr. George Prestone, an Indefatigable Botanist, and Intendant of the Physick Garden of Edingburgh, with several others in this Island. And if, after the constant and assiduous Observation of the Plants themselves, I have been enabled raptim, and as it were in a Hurry, to expose these Essays, as the Effect of the Discoveries and Improvements of one Season, I hope the Candid Reader will excuse what Irregularities and Incoherencies I have been guilty of, since 'twas the Matter, not the Manner of prosecuting my Design, I was most intent upon, that he'll accept of what is here advanced as an earnest of my Desire of Improvement, and pass by my Infirmities; for Humanum est errare, Weakness is sometimes bewray'd in the best of Performances.

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EXPLICA.



EXPLICATION OF THE TABLES



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Fig. IV. *Sherardia Dillenii*, see it describ'd at large. 156

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BOTA



BOTANICK ESSAYS.



ESSAY I.

Upon the Structure of the Flowers.



AS the Generation of *Animals* has ever been look'd upon to be one of the most mysterious Parts of the Creation, in which the infinite Wisdom of the *Great Creator* is daily more and more manifested, so the *Vegetables* have sufficient Curiosities in them wherewith to exercise those rational and super-eminent Faculties with which the Soul of Man is endow'd. *Animals* are such curious Pieces of Mechanism that the Ingenious have from all Ages consider'd them as fit Objects of diligent

gent Enquiry: but for the *Vegetables*, their Parts seem at first view to be so simple, that the prying into their Structure has been much neglected. Ancient and learned *Botanists* contented themselves with viewing the *facies externa* of Plants, in order to distinguish them from each other; and if they had the good Fortune to impose such Names upon them as are retain'd to this Day, yet they were generally so superficial in describing them by these Names, that the modern Writers in *Botany* have great difficulty to know which is which. The word *Eupatorium* was frequently us'd in former Times; now we find three Plants, vastly different from each other, under the same Name. *Eupatorium Veterum* is now understood for *Agrimonia*; *Eupatorium Avicennæ* is that which passes under the Name of *Eupatorium Cannabinum*; *Eupatorium Mesues* is the *Ageratum*. *Dioscorides* says, that the Herb *Hyssopus* is known to every one; and the learned Dr. *Tournefort* observes^a, “ That the *Hyssopus* of *Dioscorides* is an Herb, which is scarce known to any, though he performs Miracles by it; for having compar'd *Origanum* with *Hyssopus*, *Centaureum Minus*, *Tragoriganum*, *Serpillum Marum*, *Polycnemon*, *Symphytum Petreum*, *Ageratum*, *Papaver erraticum*, are all, according to him, like unto *Origanum*.” The Ancients have cer-

^a Tourn. *Isagog.* in *Rem Herb.* p. 14.

tainly had another *Centaurium* and *Chelidonium Majus*, for they could never be so ignorant as to believe *Centaurium* and *Chelidonium Minus* were of the same Genus with them.

As Arts and Sciences came to be more and more cultivated, so the delightful Science of *Botany* still arriv'd at a greater Degree of Perfection. They first began to distinguish the Plants according to the Nature and Texture of their Parts: Thus they which were of a harder, more durable and solid Substance, these were call'd *Arbores* Trees, and their Substances call'd *Lignum* Wood or Timber; such as are of a woody Substance, but not so high a Stature nor of so long Duration, these are called *Frutices* Shrubs: A third Division is called *Suffrutices* Under-Shrubs, which are woody indeed, but are of a very low Stature and short Duration, such as *Lavendula*, *Hyssopus*, *Thymus*, &c. And lastly, they are called *Herbæ* Herbs: these are of a very soft Texture, and only endure but for one Season, or at most till they have perfected Fructification, and produced ripe *Seed* for the Propagation of the *Species*, and then they decay. These, according to their Duration, are either propagated by the Seed, which, according as it ripens the first, second or third Year, if the Root decay immediately thereafter, is said to be an Annual, Biennial or Triennial Plant; or by the Root, which does not decay, but

pushes out a fresh Herb every new Season, and then it is called a Perennial Plant.

In former Times when Authors were about to give a History or Description of Plants, they had several very confus'd ways of ranking them: some according to the *Alphabet*, by which it could not be known which belong'd to one *Genus* and which to another: some according to their *Virtues*; but as there are many Plants whose Virtues are not rightly understood, and as there are several Plants of different *Genera* which partake of the same Virtues, the Distribution of the Plants after that manner is very uncertain: and some according to the different Seasons or Months in which they produce the Flower; but as there are several Plants of the same *Genus* which flower more early, or in the Spring, and others more late, or in the Autumn, as *Crocus Vernalis* and *Crocus Autumnalis*, *Gentianella Vernalis* and *Gentianella Autumnalis*, this way of classing the Plants can be useful to none but Florists, who are oblig'd to observe the Season of Flowering on purpose to adorn their Gardens at all Seasons of the Year.

At last, observing what an Harmony there was among the several Parts of the Plants; how several of them agreed together in the same Frame and Disposition of the *Leaf*, but perhaps differ'd in the *Flower* and *Fruit*; others agreed in *Flower* but differ'd in the *Fruit*; others agreed in *Flower* and *Fruit* but

but differ'd in the *Root*, as *Iris Tuberosa* and *Bulbosa*, Authors bethought themselves of classing the Plants, according to the Similitude of a particular Part of one Plant with that of another; as by the *Root* there are the *Radices Bulbosæ, Tuberosæ, &c.* by the *Leaf* *Asperifolæ, &c.* by the *Flower* according to their *Petala, Monopetali, Polypetali, &c.* Disposition of the *Flower Umbelliferæ, Corymbiferæ, &c.* according to the *Fruit Seminibus Nudis Solitariis, or Aggregatis, Capsulis inclusis, as Unicapsulares, &c.*

After that there arose a Debate among Authors, which were the principal Parts of the Plants by which they may be the most conveniently class'd together: some were for admitting of one part as only essential, others for two or three together, and a third sort were for bringing in all these as essential Parts, which kept a certain Rule, and were always the same in every *Genus*, or each individual Species: v. g. If one kind of Plants had always a *Bulbous Root*, another *Leaves* alternately upon the *Stalk*, a third *Genus* had the *Leaves* arising by Pairs, some *Genera* had an *undivided Leaf*, and in others they were *divided* into several *Segments*, they did not doubt but *Plants* might be join'd together by these *Notes*, as well as by any other.

The first we find who condescended upon any particular Part or Parts of the Plant, as being most essential, and by which they ought

to be more especially ranked together, was that celebrated Natural Historian, *Conradus Gesnerus*. He writing to *Boccone*, tells him, that he was very exact in delineating the *Seeds* and *Flowers*; “for (says he) it’s from “the *Seed* I usually determine the Affinity of “*Plants* ^b”. And again, in his *Epistle* to *Theodorus Zuingerus*, he writes, “’Tis from “these (says he) *viz.* from the *Flower* and “*Fruit* of *Plants*, rather than from the “*Leaves*, that the Nature and Affinity of “the *Plants* appear: for it’s by these Notes, “(to wit the *Fruit*, *Flower* and *Seed*) that “*Staphisagria* and the *Plant* called *Conso-* “*lida Regalis* are distinguished from *Aconi-* “*tum*, though they agree in the *Leaf* ^c.” And in his *Epistle* to *Adolphus Occon* he plainly declares his Mind, “^d *Melissa Constanti-* “*nopolitana* seems in some measure to resem- “ble *Lamium* or *Urtica Mortua*, but it dif-

^b In feminibus & floribus ἀκριβέστατα pingendis valde sum curiosus & à semine maximè cognationes stirpium judicare soleo. *Epist. Medicin. lib. 3. Epistola 13. 14 ad Bocconem.*

^c Fundamenta hic maximè ponebat Gesnerus in flore & fructu plantarum. Ex his enim potius quàm foliis stirpium natura & cognationes apparent. His notis à fructu semine & flore *Staphisagria* & *Consolidam Regalem* vulgò dictam *Aconito* συμφύλης εἶναι βοτάνας facile deprehendi. *Epist. p. 113. ad Theodorum Zuingerum.*

^d *Melissa Constantinopolitana* ad *Lamium* vel *Urticam Mortuam* quodammodo videtur accedere; seminis tamen, unde ego cognationes stirpium indicare soleo, figura differt. *Epist. p. 65.*

“ fers from it by the Figure of the *Seed*, by
 “ which I use to judge of the *Affinity* of
 “ *Plants* ^e.”

Fabius Columna is the next who declares his Mind, concerning the Manner of distributing the Plants by the *Flower* and *Fruit*.
 “ I do not value (says he) the Shape of the
 “ *Leaf* in making up the *Genera* of *Plants*,
 “ but I determine their Kindred and Family
 “ to which they belong, by the *Flower* and
 “ *Seed Vessels*, or rather the *Seed* it self,
 “ especially if they agree by the Taste with
 “ the other Parts of the Plant. This is what
 “ has not been observ'd by *Botanists* before
 “ this time, neither by *Dioscorides* himself,
 “ nor yet by the Ancients ^f.”

Cæsalpinus is the third who gave any considerable light into that of distributing the Plants by Method, as is related by *Tournefort* ^g. “ This Part of *Botany* (says he) not
 “ yet essay'd by any, was manag'd by *Cæsal-*
 “ *pinus* with a great deal of Industry; who
 “ was the only one among the *Botanists* who
 “ gave the Reasons worthy of a Philosopher,

^e Tournef. *Isagog.* in *Rem Herb.*

^f Foliorum effigiem in conferendis generibus parvi facimus; non enim ex foliis sed ex flore seminisque conceptaculo aut potius ipso semine plantarum affinitatem dijudicamus (respondente partim sapore in reliquâ parte plantæ) quod huc usque ab Herbariis nondum animadversum nec ab ipso Dioscoride nec ab antiquioribus. *Ecphras.* minus cognitarum stirpium pars altera. c. 27. p. 62 & 63.

^g *Ibid.* p. 66.

“ for distributing the Plants into a Method,
 “ according to the Manner of their Seed.”
 But he is so obscure in laying down his Method, that neither *Tabernomontanus* nor the two *Baubini* would make use of this Method of *Columna* and *Cæsalpinus*; nor would any other attempt it before Dr. *Morison*, as is justly observ’d by *Knautius*^h; and *Gaspar Bauhinus* gives the following Reason for it. “ *Cæ-*
 “ *salpinus*’s Method of Plants (says he) was
 “ much in my mind: I spent much time in
 “ reading, that I might class my Plants by it.
 “ He is a learned but most obscure Author.
 “ I had great difficulty to understand it. I
 “ know not how he can be understood by
 “ Disciples and Studentsⁱ.”

From all these it plainly appears, how long it was before *Botanick* Authors so much as dream’d of disposing Plants into a Method, and how obscurely these Hints were given, by those who first determin’d by which part of the Plant they should be class’d; so that it is evident, the true Method of distributing and classing them was never thoroughly understood until Dr. *Morison* both began and brought it to great perfection; whatever can be alledg’d

^h Method. Plant. Genuina. p. 4.

ⁱ Cæsalpini de plantis liber multum mihi obsuit, in quo legendo diu hæsi, ut in meas classes referrem: doctus est sed obscurissimus; multas mihi parit molestias in eo intelligendo; nescio an à Tironibus & studiosis intelligatur. Epist. ad Sigismund. S. Schriterium.

or affirm'd to the contrary: But how he began it, after what manner he prosecuted it, and what improvement the *methodising* of Plants has since receiv'd shall be declar'd hereafter. But as the *Flowers, Fruit, Seed Vessels* and *Seeds*, are the principal Parts of *Plants*, as 'tis chiefly by them that *Plants* have been distributed of latter Years; and as the Structure and Use of their several Parts, especially of the *Flowers*, have hitherto been much neglected, I shall first explain them separately, and then declare the Use which is made of them, in order to find out their true *Genera* and *Species*, and what their Use is in impregnating of the Seed, in order to the Generation and Propagation of the several Species.

A *Plant* is an *organical Body*, endow'd with a *vegetative* not *sensitive Life*, adhering to one particular Place from whence it receives its Nourishment; having always a *Root*, for the most part bearing *Seed*, and frequently endow'd with *Leaves, Stalks* and *Flowers*.

It might have been asserted in the Definition, that *Plants* have always *Seeds* as well as *Roots*; for we cannot suppose any *Plant* to have been first propagated but by the *Seed*; but since there are some Species which are generally barren, that is to say, which are seldom or never observ'd either to bear *Flower* or *Seed*, therefore it's said, that *Plants* for the most part have *Seed*, v. g. There is in most
Gardens

Gardens in *Scotland* the *Chamamelum Sterile*, and here in *England* as well as in *Scotland* the *Acetosa Muscovitica Sterilis*, both which are feldom or never observ'd either to bear *Flowers* or produce *Seed*, the Manner of propagating them being by the Root. The *Hedera Arborea* is said to have one Species, which is barren, but I'm ready to believe that's a Mistake; for it has been observ'd, that when it's planted in a convenient Soil, in a suitable Season, it will change the Figure and Fashion of the *Leaf*, from being blewish, broad, and more angular, to become more narrow, dark, green and pointed, after which it pushes forth the *Flower* and bears the *Fruit*. *Epimedium* and *Hydrocotyle* of *Tournefort*, or *Cotyledon-aquat.* were through inadvertency look'd upon as barren formerly, because their *Flower* is never seen unless you turn up the *Leaf*; and therefore the *Epimedium* is still known by the Name of *Barrenwort*.

Vinca pervinca, or *Clematis daphnoides*, flowers plentifully every Year, but never produces the *Pod* or *Seed Vessels* in its native Soil, especially in these colder Climates; because most of its Nourishment is spent in sending forth abundance of new Twigs and Leaves, by which it overspreads the whole Ground; but if it be put into a Pot, and all its *Stolones* or *Shoots* be taken off, but one or two of the strongest, then it will produce the *Pod* or *Seed Vessel*, which shall contain *Seed* till it ripen,

ripen, according to the Observation of Dr. *Morison* and Dr. *Tournefort*.

Acorus Verus S. Calamus Aromaticus being planted in a Garden will seldom or never bear a Flower or Spike, and but rarely in its native (*i. e.* a Marsh or waterish) Soil, because its Nourishment is as much exhausted upon its running Root below, as it is in the former upon the Leaves and Stalks above Ground.

A *Plant* is said to adhere to one particular Place from whence it received its Nourishment, because all *Plants* are not nourish'd by the *Earth*; for those called *Parasitical Plants* are nourish'd by any other Substance than the *Earth*. The *Cuscuta*, though it sprung from the *Seed* which falls to the Ground, yet no sooner does it catch hold of any other *Plant*, as *Thymus*, (upon which account it is called *Epithymum*) or upon the *Linum Sativum*, (when it still retains the Name of *Cuscuta*) it immediately quits the Earth, and by sending forth several small Nails (as it were) which are drove into the very Substance of the Plant, it receives the nutritious Particles, which are converted into its proper Substance. *Hedera Arborea* will indeed receive its Nourishment from the Earth, when it has nothing else to lay hold on or grasp, but as soon as it touches any live or growing Tree, or any Wall, whether of Stone or Brick, it fixes its Tendrils into the
Bark

Bark or Substance of the Tree, or into the Interstices betwixt the Stones and Brick in the Wall, from whence it receives its Nourishment, and quits, or partakes but little of the Earth: But the *Viscum* denies any Commerce or Correspondence with the Earth at all; for if the Berry fall to the Ground there the *Seed* perishes; but if plac'd upon any Tree it there takes root, and encreases by dispersing the Fibres of its Root throughout the whole Substance of the most solid Tree, such as Oak, and a great many other Trees, as other Plants do in the Earth.

Plants may be *Acaules* or want a *Stalk*, as the *Lichenes*, *Aphylli*, or *Nudi*, wanting *Leaves* as the *Junci* and *Scirpi*. They may want the *Flower*, at least obvious to the naked Eye, as the *Capillares*; though by the Help of Magnifying Glasses, they are observ'd to have a regular Flower as well as other Plants, which are either plac'd upon the back of the Leaf, and therefore they are called *Epiphyllispermæ*, because both *Flower* and *Seed Vessel* were formerly taken for the *Seed*, as in the *Polypod* and other *Ferns*, or upon the top of the Stalk, for which they are called *Florids*, as the *Osmunda Regalis*, and *Filicula Montana*, *Florida Perelegans*; but no Plant can be without Seed, unless there be some other Means by which the Plant is propagated.

Therefore

Therefore I cannot comply with *Dillenius's* Sentiment, who defines a *Fungus* or Mushroom, to be a kind of "barren Plant without Flower or Seed, produc'd by a putrid or rotten Ferment; (upon which account, says he, it is, that they generally spring in a moist and rainy Season, and are, for the most part, of a soft and spongy Substance) but the Species is preserv'd by a certain specific and corruptible Juice, from whence it arises; so that by this putredinous Motion the Texture and Principles of the Vegetables are much altered, and almost destroyed^k." I must confess this is a new Philosophy to me, but most improbable; for as it can be made appear by frequent Experiments, that Insects are not produc'd *à putredine*, which was the Opinion of the Ancients, *sed ab ovo*, so we have the same Reason to believe, that no kind of Plant can be generated *à putredine sed à semine*; and it's but a bad Argument, because their *Seeds* have not yet been discovered by *Microscopes*, therefore they are not; but the *Seeds* of these, formerly reckon'd *imperfect Plants*, have now been fully discovered, as fully appears from the *Memoirs of the Royal Academy at Paris*, for the Years 1711, 1712. concerning the Vegetation of the *Tubera Trees* or *Truffles*, and concerning the *Fuci Marini*.

^k Dillen. de Plant. Circa Giffam nascent. Nova Plant. Spec. Clas. de Fung. p. 27. Edit. 1719.

Leaving the Consideration of such Parts of the Plants as are of less moment for my Design, I now proceed to the more particular Description of the *Flowers*, and the several Parts of which they are compos'd.

A *Flower* then is the most tender and delicate Part of the *Plant*, remarkable either for its peculiar *Colour* or *Figure*, or for both; coherent with the *Rudiments* of the *Fruit*, to whose tender Parts it seems to give the first Supply of Nourishment.

I am not much of *Tournefort's* Opinion, that the *Flower* affords any Supply of Nourishment to the *Fruit*; (though by his Example I have made it a part of the Definition:) One part of its Use indeed may be to guard the tender *Fruit*; but for the Nourishment, both the *Fruit* and it are oblig'd to the proper *Pedicle* or *Foot-Stalk*, if there be any, or to the common *Stalk* from whence it arises, if there is no *Pedicle*, which is a liberal Mother, and nurses both equally as their several Exigencies require.

Flowers in general are compos'd of the *Petala* or *Flower Leaves*, the *Calix* or *Cup*, the *Perianthium* or *Cover-flower*, the *Pistillum* or *Pestil*, the *Stylus* or *Stillet*, the *Apices* or *Tops*, the *Stamina* or *Chives*, the *Capillamenta*, *Threads* or *Thrums*: or if you please they may be divided with the learned *Dr. Grew* into three constituent Parts, *viz.* the *Empalement* or *Calix* and *Perianthium*; the

the *Foliature* or *Petala*, and the *Attire* or inner Furniture of the *Flower*, such as the *Stamina*, *Apices*, *Pistillum*, *Stylus*, &c. or they again may be divided into their outer and inner Part; the outer Part consisting of the *Petala* and *Calix*, or *Perianthium*; and the inner, which is the same with Dr. Grew's *Attire*.

The *Petala*, according to Dr. Tournefort, are those *Leaves* which excel all the other *Leaves* of the *Plant* in *Shape* and *Colour*, and which never become the *proper Seed Vessel*; they are that thin and delicate Substance which surround the other Parts of the *Flower*, whose shining Beauty, and vast variety of Colours attract the *Eyes*, and create a great deal of Pleasure and Delight, affording a most agreeable Spectacle to Beholders both in *Gardens* and *Fields*, which engage a great many to a particular Consideration of their *Number*, different *Colours*, and variety of *Stripes*; and which, together with the Manner of propagating and improving the *Flowers* abounding with such, is become a particular Science, distinguish'd by the Name of *Florist*. In a word, they are an Ornament to the *Flower*, as the *Leaf* is to the *Stalk* and *Branches* of the *Plant*, with this Difference, that the other *Leaves* are always green, but these are still distinguish'd by their Colour. *Fabius Columna* was the first who, according to Tournefort, made use of the word *Petalon*

to distinguish the *Flower Leaves* from the other *Leaves* of the *Plant*.; since which it has always been assum'd as a *Term of Art*; and I rather chuse to call it *Petal* in *English*, than to express it by that compound Word of *Flower Leaf*. They are sometimes of a green Colour, so near to that of the other Parts of the *Plant*, that they are scarcely to be distinguish'd from the Leaves of the *Perianthium*, (whereof hereafter) unless with *Tournefort* it be observed, that they never become the *Capsula* or *Seed Vessel*; and therefore the *Flowers* of both the *Hellebores* may be said to be *Petalous*, though most of them (except the *Helleborus Niger Flore Roseo*, and that called *Aconitum Hyemale*, which is also an *Hellebore*) are of a greenish Colour, and more durable than *Petala* usually are, because they never become the *Seed Vessel* or *Capsula* to the *Fruit*; upon which account they may be distinguished into *Petala Caduca*, *i. e.* those which fall off as soon as the *Fruit* begins to set or frame, or *Seed Vessels* be so strong as to resist the Injuries of the Air; though I do not look upon that as their only Use, as some others do; and *Petala non caduca sed marcescentia*, when they do not fall off as they decay, but waste upon the top of the *Fruit*, as in the *Campanula*, and most of the *Leguminous Plants*.

The curious Dr. *Grew* has some pretty Observations upon these *Petala*, which he calls
the

the *Foliature*. “ 1. In regard of their *Texture*,
 “ they are either fat and firm, standing upon
 “ a broad and strong Base, and so need no
 “ *Empalement* or *Calix*, as *Lilies*, *Tulips*,
 “ *Columbines*, &c. or delicate, tender and
 “ fine, arising long, small and slender from
 “ the bottom, and surrounded by the *Peri-*
 “ *anthium* or *Husk*, as in *Julyflowers*, and
 “ all that kind of *Flowers* called *Flores Ca-*
 “ *ryophyllæi*, such as *Lychnis*, &c. to which
 “ the *Long Tubulous Empalement* seems to
 “ be necessary; for without it, all of them
 “ would break forth out of their *Compass*.
 “ 2. In respect of their several *Foldings*; and
 “ that either in the *Close Couch*, as in *Roses*;
 “ *Concave Couch*, as in *Blattaria Fl. Albo*,
 “ &c. next the *Plait*, as in some of the *Pea*
 “ *Blooms*; next the *Couch* and *Plait* toge-
 “ ther, as in *Marygolds*, *Daisies*; the *Rowl*,
 “ as in the *Flowers of Ladies Bowers*; next
 “ the *Spire*, which is the beginning of the
 “ *Rowl*, as in *Malva*; the *Plait* and *Spire*
 “ together, as in *Convolvulus Doronici Fol.*
 “ In some *Flowers*, where the *Attire* is lofty
 “ or spreading, as in the *Malva Rosea*. The
 “ *Leaves*, with the *Spiral Fold*, are all tack’d
 “ down at the top, thereby making up a blun-
 “ ter *Cone*, and so a more ample Space for
 “ the enclosed *Tube* and *Stamina*: In the
 “ *Poppy*, where the *Leaves* are few but very
 “ broad, and where a small *Attire* is enclos’d,
 “ they could not be reduc’d to any regular
 “ Fold,

“ Fold, least the Air should fill up the *Vacuum*,
 “ and be prejudicial to the Seed ; therefore
 “ they are cram’d up within the *Perianthium*
 “ by hundreds of Wrinkles or Puckers, as a
 “ *Cambrick Handkerchief* is, wrapp’d up and
 “ thrust into ones Pocket, &c. *

The *Calix* is the next outward part of the *Flower*. This *Tournefort* defines to be the back part of the *Flower*, distinguish’d from the *Pedicle* or Foot Stalk, by a certain kind of Grossness. By this Definition, the *Calix* and *Perianthium* must plainly differ from each other, though our Author makes no such use of it, and though most of the modern Writers use the one or the other without Distinction. But in my Opinion, that part of the *Pedicle* which is enlarg’d, and upon which the *Foliature* and *Attire* (as Dr. *Grew* expresses it) are plac’d, is the *Calix* of the *Rose*; and those five Leaves which surrounded the Bud before it was blown, may be properly called the *Perianthium*, from the Greek $\piερὶ τὸ ἄνθος$; and I think Dr. *Grew*’s word, *Empalement*, would import the same: Indeed the word *Calix*, as it signifies a Cup or Vessel, which contains any Liquor, may imply that part which supports the Flower, and upon which it is plac’d, and that part which involves, surrounds and guards it: but as *Calix* is become a Term of

* *Grew’s Anatomy of Plants*, Book I. Chap. 5. pag. 36.
 and Book 4. Chap. 2. pag. 164.

Art, as there is a palpable Difference betwixt it and the *Perianthium* in several Plants, as is observ'd in the *Rose*, where ever such Difference appears, I would call each by their proper Names; or at least I would so use the one, as not to neglect the other: Thus the *Calix* is the *Pedicle*, or Foot Stalk enlarg'd, to grant Space to the *Rudimentum Fructûs*, which afterwards becomes the *Hip* in the *Rose* fill'd with those hard Seeds, commonly called the *Acini* or Stones; but the *Perianthium* is a Production of this *Calix*, or so many, *viz.* five Leaves arising from it, of a different Substance, the one being at first thick and pulpos, the other thin and membranous, broad at the Base, and narrower as the Bud tapers, and becomes *pyramidal* towards the top, straitly enclosing, and earnestly preserving the enclos'd tender *Petala*, until they have acquir'd a suitable Bigness, and such a durable Consistence, as to render them capable to resist the Injuries of the Air when blown; and these five Leaves of the *Perianthium* pleasantly depart from each other, and readily give way to the *Petala*, whose *Moles* is augmented by degrees, and strictly guarding and strengthening them at their *Ungues* or *Origine*, least by the Weight of the inner *Petala*, (especially in the full or Hundred leav'd *Roses*, as they are call'd) they should be too much depress'd, or violently distorted, and turn'd out of their natural Situation: Therefore it is, that

the *Calix* is seldom or never without a *Perianthium*, or a Division into so many green Leaves, (for 'tis by the Colour that they are distinguish'd from the *Petala* in most Flowers) which involve the *Petala* before Expansion, and guard and surround them after they are blown. Their Number is uncertain; sometimes where the *Petala* are few, the Leaves of the *Perianthium* are so too; they are either of the same Number, or just half so many, whether even or odd. *Leucanthimum* and *Alsine*, are *Pentapetalous*, the former has five Leaves, and the latter ten, for the *Perianthium*. The *Pæonia*, while in the Bud, is covered with five Lives, arising streightways from the *Pedicle* it self, and are no ways Productions of the *Calix*, whereof the three inner are more thin and expanded Leaves, which over-spread the whole Bud; and the two outer ones are stronger, more round, situated at the Base of the Flower, to strengthen the other three, that they may be the more able to support the Weight of the Bud before, and Flower after *Expansion*, or after it is blown. In the *Calendula*, and *Bellis*, and most of the *Corymbiferae Radiatae*, there are a great many Leaves of the *Calix* which are divided from each other, making up a double or treble Border of a *Perianthium*, to support the *Petala* after Expansion, and keep them in their due Order. The *Calix* of such and the like Flowers, are either of one continued Piece, and
divided

divided into the Leaves of the *Perianthium* at the Border, or they are compos'd of several minute, thin Leaves, so dispos'd as the Scales of a Fish, and therefore are called *Calices Squamosi*, as in the *Capitatae*, such as *Jacea*, most of the *Corymbiferae Nudae* and *Radiatae*; and it is to be observ'd, that in the *Corymbiferae Nudae*; that is to say, when they want a Row of half Flourishes round the Border, then there is scarce any *Perianthium*; for there being no long *Petala*, or half Flourishes to support, there is no need of such.

According to this Distinction, it seems improper to call those two *Leaves* which guard the *Flower* of the *Papaver*, *Chelidonium maj.* *Glaucium*, or *Papaver Corniculatum*, till they are blown, and then do fall off, their *Calix*, and not their *Perianthium*; though Mr. Ray is pleas'd to call it *Calix Bifolius*, *Fugax Borrage*, *Chelidonium minus*, *Hepatica Nobilis*. *Tormentilla*, have rather a *Perianthium* than a *Calix*, because the five Leaves of the one, the three of the other two, and the four in the fourth, are divided to the *Pedicle*, which cannot answer the Definition of the *Calix*; neither do I think all the *Pentaphylla* and *Pentaphylloides*, which have alternative broad and narrow Leaves; the *Althea* and *Malva*, which have a double Row of them; nor the *Alcea*, which has but one Row, can be said to have a *Calix* but *Perianthium*. In the *Malvaceous* Kind, these

Leaves are as ready to guard the *Fruit* as the *Flower*, some more firm, and closely furrounding it, as the *Althea* and *Malva Rosea*; others not covering the whole *Fruit*, as the *Malva Vulg.* and *Arborea Maritima*; and others more loosely covering it, as it were a *Bladder*, as the *Alcæa*; I say, in that case, these *Leaves* may be called *Pericarpium*.

" In a word, There may be a *Perianthium*
 " without a *Calix*, according to the foregoing
 Examples; as also in the *Male*, formerly called
Barren Flowers of the *Pomiferæ Scandentes*; according to this Rule, that when
 " the *Leaves* are divided to the *Pedicle*, and
 " that the *Pedicle* at the bottom of the *Flower*
 " is no more enlarg'd, and has not become
 grosser than there elsewhere, then it is properly
Perianthium: But very rarely, unless
 " in the former Example of the *Flores Nudi*,
 " shall you see a *Calix* without a *Perianthium*.
 I own there are some *Flowers* which have a
Tubulous Calix, as the *Labiata* or *Galeata*,
 and *Verticillata*, which afterwards becomes
 the *Pericarpium*, (as is observ'd in the
Malva's) and guards the four *Seeds* till they
 are ripe; though Dr. *Tournefort* calls them
Capsula's, which I think is wrong; for as I
 " take it, *Capsula* is a *Receptaculum Seminis*
 " or *Close Vessel*, which preserves the *Seed*, and
 never is opened till the *Seed* is ripe; here the
Vessel is always open at the top: I say,
 these *tubulous Guards* of the *Flower*, and
 Preservers

Preservers of the *Seed* in the *Labiatae*, and Surrounders of the Pod in most of the *Papilionaceous Flowers*, may be called *Calix* or *Perianthium*, as People shall think fit; or if it seem good still to keep up the Distinction, that part which guards the bottom of the *Flower*, and preserves the *Seed*, may be called *Calix*, and the expanded part which cover'd the tender *Bud*, and is divided into five pointed Portions after the *Flower* is blown, may be called the *Perianthium*. Thus far I have thought fit to instruct the young *Botanists*, that they may know where the Distinction of *Calix* and *Perianthium* lies, that they be not at a loss when they hear them term'd sometimes the one, and sometimes the other. The *Calices*, or rather the *Perianthia*, are divided into *Monophyllous* and *Polyphyllous*, as the *Flowers* are into *Monopetalous* and *Polypetalous*. Mr. *Vaillant* gives the Distinction betwixt them, viz. "When you pull the one from the other, if it be *Monophyllous*, then they will be torn at the sides; but if *Polyphyllous*, then the sides shall remain entire, even to the *Pedicel*."

Having thus discours'd of the outer and surrounding Parts of the *Flower*, viz. the *Petala*, *Calix* and *Perianthium*, I come next to its surrounded Parts, by Dr. *Grew* called the *Attire*; and these are either the *Male Parts*, such as the *Stamina* and *Apices*, or

Female Parts, such as the *Stylus* and *Pistillum*.

The *Stamina* or *Chives*, are several long, small, round Portions, arising either from the inner Surface of the *Petala*, especially in the *Monopetalous Flowers*, or bottom of the *Flower*, surrounding the *Pistillum*, each endow'd with a proper *Apex* or Top, by which they are distinguish'd from the *Stylus*, which either has no *Apex* at all, or if it has, is of a quite different Figure and other Colour, from the *Apices Stamina*, and from a *Capillamentum*, which is either divided or not divided at the upper Extremity, but still without an *Apex*. Mr. *Vaillant* divides them into the *Head*, which is the *Apex*, and the *Tail*. When they arise from the bottom, they are of a quite different Texture and Colour from the coarse Substance of the *Calix*, but consisting of fine and delicate parallel Fibres; are rather of the same Nature with the *Petala*, from which however they may sometimes differ in Colour, yet seldom or never in Texture. Their Number is often the same with the Number of the Segments in the *Monopetalous Flowers*, or the *Petala* in the *Polypetalous* ones, where the Number of the *Petala* is certain and determin'd, especially in the *Tetrapetalous* and *Pentapetalous* ones. Thus I have often seen in *Tormentilla* and *Ruta*, both of which are *Tetrapetalous* for ordinary, that if they had chanc'd to vary, the *Tormentilla*

mentilla had five Leaves in the *Perianthium*, if it became *Pentapetalous*, and *Ruta* had five *Stamina*, and became *Pentacapsular*, if it chanc'd to be *Pentapetalous*. *Camerarius* and Mr. *Vaillant* give us several Examples wherein the Number of the *Stamina* differ from that of the *Petala*; *Iris* has six *Petala* (*Camerarius* calls them nine, mistaking the *Tripartite Stylus* (Fig. 8. 222) for three of the *Petala*) to three *Stamina*, *Gladiolus* six to three, *Veronica* two to four *Segments*: The *Tetrapetale siliquosæ* six to four *Petala*, eight to many of the *Papylonacæ* which have only four *Petala*; *Balsamina*, according to Mr. *Vaillant*, has five *Stamina* to four *Petala*, *Hypocastanum* seven to five, *Cardaminum* and *Acer* eight to five, &c. Where the Number of both *Stamina* and *Petala* are determinate and certain, then it is easie for those who are at pains to observe them, to find out the Proportion they bear to one another; but few are at pains to sum up the Number of the *Stamina* or *Petala*, in the *Polypetalous* ones, i. e. such as exceed six; for beyond that, the Number of the *Petala*, and far less of the *Stamina*, is certain, as in *Ranunculi*, and most of the *Rosaceous Flowers*; *Chelidonium minus* and *Hepatica Nobilis*, have each for the most part eight *Petala*; most of the other single *Ranunculus Flowers* are *Pentapetalous*; but neither is that a Rule; and for the *Stamina*, that's altogether uncertain, especially
in

in the *Semine Nudo Polyspermæ*; some have such an abundance of *Stamina*, as the *Filipendula*, *Ulmaria*, that Mr. Ray by accident called them *Staminei*; for which being call'd in question, because the *Stamineous Flowers* make up a very large *Genus*, he altered the Expression afterwards, and called them *Staminosi*.

Every one of the *Stamina* has its proper *Apex*; these *Apices* are divided into two *Lobes* or *Celluls* of different Figures; those of *Malva* appear to be round to the naked Eye, and those of the *Lillies* and *Iris* are long, (1. *Fig. 1. l. Fig. 2. 2. Fig. 9.*) those of the *Lillies* have rather four than two *Celluls*, for there are two *Laminae* join'd together *Longitudinally*, by a *Septum intermedium*, and each of these *Laminae* are folded up towards the *Septum*, the one above the other; the Point of the hollow *Stamen* is fix'd to the Center of the *Septum*; before the *Flower* is blown it enters the forked Extremity, and is situated betwixt the two upper *Celluls*, being fixed to the Center of the *Stamen*; but no sooner is the *Flower* open, and the *Celluls* begin to shed the Dust, than it quits its hold of any other part of the *Apex*, but where its Point is fix'd; and thus 'tis so equally pois'd, that it must be shaken by the least Breath of Wind, and so disperse the *Farina* by degrees, by the forked Extremity till all the Dust is ripe; and then the whole *Laminae* are spread forth if it
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is moist Weather, but in hot and dry Weather they are immediately crumbled up and dry'd. Thus I suppose it fares with all the *Flowers* with long *Apices*; but such as are round or globulous, whose *Stamina* are either crumbled within the *Calix*, or which are so fix'd upon the *Stamen*, that they do not move so easily as the former, the *Membranes* of their two *Celluls* for the most part open with an Elasticity, and shed forth the Dust all of a sudden, as Mr. *Vaillant* has express'd it at large, in treating of the *Parietaria* where the *Stamen* lies hid, and wrap'd up spiral ways like a Cork Screw, that you see nothing of the Flower but the four *Apices* till the Dust is ripe, especially in the Morning, when the Sun Beams begin to beat upon it; then do the *Stamina* extend themselves, darting out as it were the *Apex*, upon which the slender *Membranes* of the *Celluls* burst, and shed forth the *Farina quaquaversum*; the same I have observ'd with a great deal of Pleasure in the *Katkins* of the *Mulberry* in the Month of *April*, where these Flowers consist of four *Apices*, and have their *Stamina* crumbled up within the *Calix*, as the *Parietaria*, but several of them are join'd to a *Midrib*, and make up the *Fulus* or *Katkin*, of the same Shape with the aggregate Fruit, consisting of several little pulpous or juicy Berries, adherent to one common *Pedicle*, like the Fruit of the *Rubus* or *Bramble*, with this difference, that the *Mulberrys* are oblong,
and

and those of the *Bramble* round or spherical ; but of this more hereafter.

The *Capillamenta* or *Chives*, are said by Dr. *Tournefort* to be the same with the *Stamina*, only that they want the *apices*. They are the small Threads or Thrumbs we observe to be lodg'd among the *Corymbiferæ nudæ* and *Radiatæ* ; also among the *Flore composito papescentes* and *Lactescentes* of Mr. *Ray*, or in the *Flore flosculoso*, as *Scabioso semiflosculoso*, as *Sonchus*, *Lactuca*, &c. and *Radiato* as *Calendula*, of *Tournefort*. They are either *Bifida*, or divided into two Portions at the top, or *Simplicia*, whereof hereafter. So soon as these *Flosculi* or little *Flourishes* open, then these two Portions separate from each other, and are bended downwards like two Fish-hooks. Sometimes they are covered with a *Vagina* or Sheath at the top, which appears blackish in the middle of the *Flourish*, until it is fully blown, and then the *Sheath* falls off, and the two Portions separate, and both being loaded with a *Farina* or *Dust* (such as is contained in the *Apices* of other Plants) it is then dispers'd. The use of this upper Sheath (so I must call it in Distinction to that in the lower part of the *Flosculum*) seems to be to preserve the top of the *Capillamentum* till the *Farina* is fully ripe. This is very observable in the *Flos solis*, or *Sunflower* (where it is very obvious ;) *Calendula* and several other *Radiate Flowers*, where the
upper

upper *Vagina* is so small, that it requires a Magnifying glass to observe it. Some compare them to the *Stamina*, but I rather chuse to compare them to the *Stylus* in other Plants; for 1st. They have no *Apices* or *Tops*. 2^{dly}. They arise from the bottom, and not from the sides of the *Flourish*. 3^{dly}. Each of them are situated upon the *Embryo seminis*, as the *Stylus* is upon the *Pistillum* of other Plants. Their number is indefinite, according to the number of the *Flourishes* and *half Flourishes*; and here it will not be improper to declare what is meant by the *Flourish* and *half Flourish* of a Plant.

A *Flourish Flosculum*, is a *Petalon* or *Flower Leaf*, which (as the *Petala* do in other, especially *double Flowers*) make up the whole Flower. They are long, small, hollow *Tubes*, expanded and divided into five, for the most part, pointed *Segments* at the top, either equal, as in the *Corymbiferae nudae*, as *Tanacetum*, or in the *discus* of the *Radiatae*, as *Calendula Jacobaea*, &c. or into *unequal Segments*, as in *Scabiosa Cyanus*, &c.

The *Semiflosculi*, or *half Flourishes*, are *tubulous* or hollow at the bottom with the former, and soon spread forth into a *petalon-planum*, a broad, plain, *flower Leaf*. These either make up the whole *Flower*, as in *Dens Leonis*, *Hieraceum*, *Scorzonera*, *Trago-pogon*, &c. or along with the *Flosculi*, make up the *Corymbiferae Radiatae*, i. e. when the *Corona*

or

or *Radius*, the utter Border of the *Flower* next to the *Perianthium* or *Calix*, consists of the *Semiflosculi*, and the *discus*; the middle part of the *Flower* consists of the *Flosculi*, as in *Calendula*, *Bellis*, *Chrysanthemum*, *Flos solis*, &c.

Each of these *Flosculi*, and *Semiflosculi*, are situated upon the top of an *Embryo seminis*: At the bottom of each of them arise five small Portions or Columns, all which in a little unite together, and make up a *Vagina* or Sheath, surrounding the *Capillamentum*, which, as is said, arises from the top of the *Embryo seminis*. They are either *Bifida*, as above, or *Simplicia* undivided, as in *Scabiosa Centaurium maj.* &c. The use of the Sheath is to receive and contain within Bounds the *Dust*, as it falls upon the top of the *Embryo seminis*.

These being the Male Parts of the *Flower*, whose Use shall be declared hereafter, I now proceed to the *Female Parts*, viz. The *Stylus* and *Pistillum*; The *Stylus* for the most part accompanying the *Pistillum*, as the *Perianthium* does the *Calix*, is as much neglected to be mentioned by the Moderns, as the *Perianthium*; but the same Reason holds for using both; for when the *Stylus* and *Pistillum* meet both together, the *Stylus* is situated upon the *Pistillum*, but seldom of the same Substance, for when the *Pistillum* begins to swell, then the *Stylus* takes his leave
and

and falls off, which shews they are not continuous, but contiguous to each other.

A *Stylus* then, is a long, small, round Portion, more or less hollow, according to its bigness, placed in the center of the *Flower*, sometimes upon the top of the *Pistillum*, and sometimes not, always without such an *Apex* as the *Stamina* have, but sometimes covered with an *Operculum* or Lid, as in the *Lilies* (*aaa*) and sometimes fimbriated or fringed, being divided into several small Hairs at the upper Extremity, as in the *Mallows* (*f*)

The *Stylus* may be without the *Pistillum*, as in the *Galleatæ* and *Verticillatæ* and *Asperifoliæ*, where the *Stylus* is in the Center, and the four *Embryones*, which afterwards become so many Seeds, surround and support it. Dr *Tournefort* in this Case calls it, *Pistillum quatuor Embryonibus stipatum*; though according to his own Acceptation of the *Pistillum*, it does not become the *Fruit*. The *Malva* also has an *Orbicular Fruit*, consisting of several *Cap-sulæ*, according to Dr. *Tournefort*, or of *Semina nuda, in orbem Rotuli aut Caseoli formam posita*, according to Mr. *Ray*, all which adhere to the *Stylus* plac'd in the middle; and this again is guarded by a *Pyramidal Tube*, upon which the *Apices* are plac'd (*dd*) Now *Tournefort* in this Place neglects the *Stylus*, and only speaks of the *Fructûs rudimentum*, as the *Pistillum*, giving the *Stylus* (*f*) the

(*aaa*) Tab. 1. Fig. 1. (*f*) *ibid.*, (*dd*) Fig. 10. (*f*) *ibid.*

Term of *Axis Medius*, which plainly shews, that the *Stylus* and *Pistillum* are two distinct parts of the Flower.

Camerarius indeed speaks of the *Stylus* and *Pistillum*, as one and the same, and only makes the *Stylus* the upper, and the *Pistillum* the lower part of the *Embryo Fructus*: *Simultaneum istum petalorum apicumque exortum sequitur brevi tempore similis dilapsus, & tum Styli superstitis partem inferiorem intumescere, superiorem autem quasi Infundibulum paulatim marcescere notant Botanici.*

But as I hope I have made it obvious, that the *Stylus* and *Pistillum* are for the most part two distinct Portions, and that there may be a *Stylus* without a *Pistillum* at least under it, so there may be a *Pistillum* without a *Stylus*, as in the *Papaver*, &c. In a word, according to Mr. *Tournefort's* Method, the *Pistillum* is that part which becomes the *Fruit*, which the *Stylus* never do's, and it is always situated within the *Flower*, as the *Calix* is without it.

I have hitherto neglected to give the Use of all these Parts, because I shall treat of it elsewhere, I now proceed to the general Consideration of the Flowers themselves, and shall divide them either in respect of their Structure or Use.

In respect of their Structure, they are either *Monopetalous*, *Polypetalous* or *Apetalous*, and *Stamineous*, I rather chuse to divide them
thus,

thus, than with Mr. *Vaillant* to divide them into *True* and *False*, *Complete* and *Incomplete*, *Perfect* and *Imperfect* ones ; for in my Opinion, no created Being can be called *Imperfect*, so long as it consists of all those Parts by which it was design'd to be propagated and preserv'd at the *Creation* ; and we are not to look upon those called *Apetalous*, or *Stamineous Flowers*, as *imperfect*, because they are not endow'd with those beautiful *Petala*, by which they are render'd so obvious and so delightful to the Eye: Nor upon those called *barren Flowers*, as the *Cucumers* and *Melons*, as *incomplete*, because when they fall off they leave no Fruit behind them. *God* who is the *Author* of Nature, or *Nature* it self, *viz.* That second Cause by which one Effect produces another towards the Generation, Preservation, and Propagation of any *Created*, whether *Animated* or *Inanimate* Being, never do's any thing in vain ; and if these our Author calls *Incomplete* or *False Flowers*, do answer the Uses for which they were at first design'd, and consist of Parts fit for that Purpose, I see no Reason why such a Plant should be called *Imperfect*, for that would imply that it wants some Parts which hinders it from performing those *Offices* for which it was at first design'd ; but of this more hereafter.

A *Monopetalous Flower*, is that which has *one Petalon* or *Flower-leaf* ; they are

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for the most part divided into five *Segments* at the Border, or a little deeper; but sometimes into three, as in the *Unilabiatae*, as *Scordium* when the four *Stamina* supply the *upper Lip*. *Anomala* as *Acanthus*, when the Leaves of the *Perianthium* supply the upper Lip; sometimes into four *Segments*, as the *Veronica species*, and sometimes they are not divided at all, but being *Tubulous* at the bottom, they are afterwards expanded towards the Extremity, ending in a sharp Point, as *Arum*, *Aristolochia*, &c. and sometimes not expanded, blunt at the Extremity, as *Digitalis*; but the various Figures of *Flowers* are extrinsick from my Purpose, I shall only add, that *Monopetalous Flowers* are sometimes so deeply divided, that they can scarcely be distinguished from *Pentapetalous* ones: Thus *Malva* has been by some mistaken for a *Pentapetalous Flower*. And Mr. Ray, to reconcile the matter, calls it *Pentapetaloid*; and *Oxys f. Trifolium acetosum*, is by most Authors reckon'd *Pentapetalous*, though Dr. Tournefort calls it *Monopetalous*. The common way of distinguishing the *Monopetalous* from the *Polypetalous Flowers*, is to observe whether it falls off together, or in several Portions. Mr. Vaillant gives the following distinguishing Marks: 1st, If the *Calix* is *Monophyllous*, then the Flower is *Monopetalous*. 2^{dly}, If the *Stamina* must be separated from the sides of the *Petala*, then 'tis *Monopetalous*,

lous, as in *Gentiana*, *Campanula*, and most, if not all of the *Lip-flowers*; but if the *Stamina* immediately arise from the bottom of the *Flower*, as in the *Lilly*, then the Flower is *Polypetalous*.

The *Polypetalous Flowers*, are such as consist of more *Petula* than one: Thus they are *Bipetalous*, as *Circaea*, which is the only *British* Plant, I know of, that is so. *Tripetalous*, as *Phalangium Virginianum*, *Plantago*, *Aquat. major* and *minor*. *Tetrapetalous*, as *Papaver*; all the *Tetrapetalæ*, *Siliculosæ* and *Siliculosæ*. *Pentapetalæ*, as several of the *Rosaceous Flowers*, viz. *Ranunculus*, *Pentaphylla*, *Umbelliferae*, and the *Flores Caryophylli* of *Tournefort*. *Hexapetalæ*, as the *Lillies*, and all the *Lilliaceous kind*. The *Iris* and *Xyphion*, or *Iris Bulbosa*, is truly a *Monopetalous Flower*, divided into six *Segments*; and I suspect there are several others of the *Lilliaceous kind Monopetalous* too, and therefore *Tournefort* being aware of this *Objection*, says, he has not establish'd this *Class*, because that all of them are *Hexapetalous*, but because all of them have a *Tricoccous Fruit*, or a *Fruit* divided into three *Loculamenta* or *Pouches*. I have already observ'd, that *Camerarius* calls *Iris*, *Enneapetalous*, being led into this Mistake by *Mr. Ray*, who once said so, which he afterwards retracts. The Truth is, at first Appearance the *Iris* seems to have nine *Petala*,

but if any one shall trace the *Stylus*, they'll find it to arise by a small, long, round Portion from the *Calix*, and to be contain'd for half an Inch length within a green *Vagina* or Sheath, till it arrive at the bottom of the *Flower*, where 'tis expanded into three narrow, bifid *Petala*, lying horizontally in the middle of the *Flower*, each hiding a *Stamen* below it: Another Reason why it's *Monopetalous* is, that it is *Flos non caducus*, which no *Polypetalous Flower* is. After the number of the *Petala* has come the Length of six, it is never afterwards determin'd, but all pass under the Name of *Polypetalous*.

The *Apetalous* or *Stamineous Flowers*, are a large and numerous *Class*; they consist of the *Calix* or *Perianthium*, and several *Stamina*, with their *Apices*, without any *Petalon* or *Flower-leaf*. Some of them have a *Capsular Fruit*, as *Asarum*, *Beta*; others have one single Seed succeeding to each Flower, as *Acetosa* and *Lappathum*, where there's an *Hexaphyllous Calix*, with several *Apices*; three of the Leaves of the *Calix* being broader, are enlarg'd afterwards, and become the *Capsula* to a three-corner'd Seed, and the other three become the Base of the *Fruit*. The *Acetosa Britannica*, of which I have discours'd at large in my *Miscellaneous Observations*, has a *tetraphyllous Calix*, and a flat, instead of a *triangular Fruit*. Tournefort says, There are some Species of the *Atriplex*, whose

whose Flower arises separate from the Fruit; i. e. has *Male* and *Female Flowers*: The same is also observable in several Species of the *Acetosa*, as in the *Arvensis Lanceolata*, *Pratensis*, *Vesicaria*, &c. though he makes no mention of it. He justly makes two distinct *Genera* of the *Atriplex*, the one with a *flat Fruit*, which he calls *Atriplex*, and the other with a *starry Fruit*, among whom is *Atriplex fœtida*, and *Bonus Henricus*, *Blitum*, *Herniaria*, *Paronychia*, *Achimilla*, *Parietaria*, &c. with which Mr. *Vaillant* makes such a Work. All these have one *Seed*, succeeding an *herbaceous* or *greenish Flower*; but there are some Species of the *Persicaria*, *Potamogetons*, *Polygonum*, *Bistorta*, &c. whose *Calix* consisting of finer *Leaves*, and a brighter Colour, may at first View be mistaken for petalous Flowers. That large Tribe of *Flowers*, consisting of the *Frumenta Semine Esculento*, or *Farinaceo*, as *Triticum*, *Hordeum*, &c. which are *Spicata*, when many of their *Flowers* and *Seeds* are compactly join'd together, and are adherent to a *Mid-rib*, or *Axis-mediæ*, or in *Fasciculos Pendulos Disposita* as *Avena*, *Paniculata*, as *Milium*, *Panicum*, &c. and the *Gramina semine non Farinaceo*. All these have a *Stamen*, with a large *Apex*, which are the Forerunners of each single Seed. The third *Genus* of *Apetalous Flowers*, are such as arise in separate Parts from the Fruit, in the

same Species as *Cyperoides*, *Typha-Mayes* or *Turkey-Wheat*, &c. of which Mr. Geoffroy gives an account in the *French Memoirs*, viz. that there first appears a Spike of *Flowers* upon the top of the Stalk, which so soon as they are decay'd, there appear two or three Bundles of small Threads, which are the *Stylus* of the *Seeds*, hid as yet in *Foliorum alis*; but they afterwards swell and become a Fruit, consisting of a great many *Seeds* upon a long *Spike*. The fourth kind of these *Apetalous Flowers*, are such as arise upon different Plants, of the same Species, *i. e.* some Plants will produce Spikes of Flowers, to which no Fruit or Seed shall follow, when others shall have small *Globules*, several of which shall be compactly join'd together, which afterwards become the Seed without any previous Flower, as *Cannabis Mercurialis*, *Spinachia*, *Urtica*, *Lupulus*; though some Species of the *Lupulus* shall have Spikes of the Flowers and Fruit, and other Plants shall have *Globules* of the Fruit or Seeds, upon the same Stalk, as *Urtica Romana*, &c.

There are also several Trees, whose *Apetalous Flowers* arise in different Branches of the same Tree, or in different Trees of the same Species. Several of these *Flowers* are sometimes more compactly, at other times more loosely join'd together upon an *Axis-medius*, or *Mid-rib*, and this *Cluster of Flowers*, as I may call them, is called Ἰσλον in the

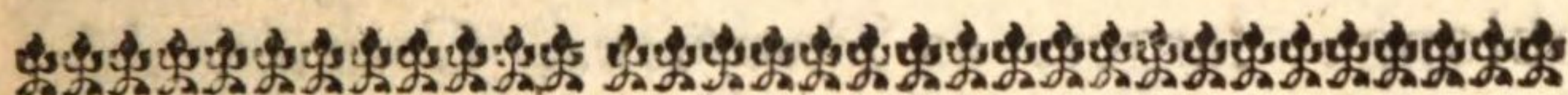
the *Greek*, *Fulus* and *Amentum* in the *Latin*, *Chaton* in the *French*, and *Katkins* in the *English*. They are either *pendulous* or *hanging downwards*, as in the *Avellana*, *Corylus*, *Nux juglans*, &c. where one, two or three greenish, or herbaceous, small, round Leaves are placed upon a small, short Pedicle, arising from the *Costa-media*, *Axis*, or *Middle-rib*: These Leaves are convex above, and being concave below, cover several little *Stamina*, or rather *Apices*, which compose the *Flowers*; these *Flowers* are thick set and regularly dispos'd upon this *Axis* or *Mid-rib* (which arises from the Branch, and for the most part appears before the Trees are broke, *i. e.* before the Leaves are push'd forth) and hangs so loose, that the least Breath of Wind shall make them shake, of which the ingenious Mr. *Bradly* gives this handsome Account. " This Tree, says he, " *viz.* the *Hazel* or *Philbud*, in *January* " puts forth what are commonly call'd *Kat-* " *kins*, which are long *Thrums*, compos'd " of very *small Flowers*, which towards the " beginning of *March* are cover'd with a " fine *Dust*, or *Male-seed*; 'tis then the *Blos-* " *soms* or Female Parts appear on the Buds " of the same Tree; they are very small, " and hardly to be discern'd without strict " Enquiry, only offering to the View a small " Cluster of Scarlet Threads, which are so " many *Tubes* leading to the *Rudiments* of

“ the *Nuts* : This happens at a windy Sea-
 “ son of the Year, that the Male Dust may
 “ be the more easily convey’d to the *Utri-*
 “ *cles*, or *Female Blossoms* of the *Plant*”.
 There are other *Juli* which are not pendu-
 lous, or hanging downwards, but when the
 new *Stolones* or fresh Shoots of the *Tree*, v. g.
 in the *Firr* and *Pine-tree*, do begin to extend
 and be lengthen’d, then it is that these *Juli*
 or *Clusters* of thick-set *Flowers*, consisting
 of fine, small, yellowish *Leaves* of the *Ca-*
lix and several *Apices*, do not adhere to a pro-
 per *Mid rib*, but are plac’d round the new
Stolones; these are blown about the middle of
May, and shed their Dust towards the latter
 end of that same Month. There was Rea-
 son for the *Juli* of the other to hang down-
 wards, to be so much expos’d to the Wind, and
 to shed their Dust so early, because the Leaves
 would have afterwards hindred the Dust from
 falling upon the *Embryones*, and the *Fruit*,
 is also ripen’d in the same Season; but for the
Firr and *Pine-trees*, they being Ever-greens,
 and usually having their *Cones* a Year upon
 the Tree before it is ripe, there is no need of
 so early a Season for them, nor to be so tick-
 lishly plac’d as to be shaken with every Wind,
 nor of such haste to shed the Dust, because
 their Apples take time to grow. Flowers may
 be otherwise distinguish’d, according to their
 Sexes, but we shall leave that, as also the decla-
 ring of the Use of this Dust, to another Part.

B O T A



BOTANICK ESSAYS.



ESSAY II.

Upon the Fruits of Plants.



Fruit is an *annual* Part of a Plant, adhering to, and succeeding the *Flower*, and containing the *Seed*; which when ripe, or come to perfection, falls down of its own accord, if not timely pull'd from the Plant.

Though it be said to be *annual*, yet there are some *Fruits* which will remain two Years upon the Tree, as *Figs*, *Oranges*, *Lemons*, &c. as also the *Pine* and *Firr Apples*; but these singular Examples are no Objections against a general Definition.

Fruits are either *esculent*, *i. e.* when that Substance which surrounds the *Seed* is eatable by Man; though it seldom becomes a convenient Food: They are;

1. *Pomiferous*: And these are such as grow upon *Trees*, which consist of a thick and firm *Parenchyma*, or fleshy Substance, surrounding five *membranous Celluls*, containing so many *Seeds*, as in Apples, properly so called, Pears, &c. or whose *Parenchyma* is loose, spongy and juicy, containing the *Seeds* in the middle, as in *Oranges*, *Lemons*, &c. The *Herbaceous Pomiferæ* are oblong; larger, as *Pompions*, *Gourds*, *Melons*, &c. or lesser Apples, as *Cucumbers*; all which have a firm *Parenchymatous* outer, and more spongy, juicy and *cellulous* inner Substance, in which a great many *Seeds* are lodg'd.

To these *Pomiferæ* may be added the *Fig*; which although it be a *Fructus sui generis*, yet in regard of its Bigness, Figure, and *Parenchymatous* Substance, not so juicy as the *Baccæ*, may as well be class'd among the *Pomiferæ* as among any other kind of *Fruit*. This singular *Fruit* contains its Flowers in the middle; as has been observ'd of old by *Cordus*, and more particularly of late by *Mr. de la Hire*, as in the *Memoirs* of the Royal Academy at *Paris*, *an. 1711*. who says, that in the middle of the *Fig* there are a great many *pentaphyllous* or *tetraphyllous Calices*, which
arise

arise from the insides of the *Fruit*, and are endow'd with a great many *Stamina* and *Apices*, with the *Pistillum* or *Stylus* in the middle, to which succeed several small *Seeds*.

2. *Bacciferae*: The *Berries* are distinguished from the *Apples*: 1. In their Bigness; the *Berries* being much less than the other: 2. They are of a more lax Texture, and more juicy, having their *Seed* not lodg'd into distinct *Celluls*, as most of the *Pomiferae* are, but dispos'd indifferently amidst the inner *Pulp*, as in the *Grapes*, *Gooseberries*, *Currans*, &c. which grow upon Shrubs; for the Vine can be reckoned no other, unless by its high Ascent, by means of the *Claviculae* or *Climbers*, by which it grasps Trees, Poles, or what else is next to it: There are also *Bacciferous Trees*, such as the *Morus*, *Myrtus*, *Laurus*, *Sambucus*, &c. and *Bacciferous Herbs*; and these are *Magis Sparsi*, as in the *Asparagus*, *Solanum*, &c. or *Coacervati*, as *Arum*, *Dracontium*, though Mr. Ray is pleas'd to class both together, under one and the same *Title*; they may also be said to be *aggregate*, as in the *Morus* and the *Rubus*, when a great many small *Globules* join'd together make up a *Fruit*. There are also *Berries* of a more dry Substance, as the *Baccæ Juniperi* and *Oxyacanthæ* or *Hawthorn Berries*.

3. *Testaceæ* or *Stone Fruit*: These are such whose external Substance is *Parenchymatous*;

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in some more firm, as *Apricocks*, *Peaches*, &c. others longer and more juicy, as the *Plumbs* of all sorts; and others more round and less, as *Cherries*, &c. all these have a hard Stone in the middle, containing one single Kernel or Seed. These Stones consist of two equal Portions so firmly united, that no Art can separate them without breaking the Shell; but when put into the Ground, the Seed or Kernel begins to swell, and to be dilated, in due time, by which the two sides of the Stone are forc'd from each other, and the Seed is thus freed from its *Claustrum* or Prison.

With the Stone Fruit may also be reckoned the *Nuciferae*, or *Nut-bearing Trees*, some of which are covered with a thick, smooth, outer Rind, and hard Shell, as the *Walnut*; others with a rough one, but *membranous* Shell, as *Chest-nut*; and others have a hard Shell, and *membranous* outer Husk, as the *Avellana* and *Corylus*, the *Filbud* and *Hassel-nuts*.

I come next to the *Fructus non Esculenti*, the not-eatable Fruit; but before I consider them, I shall take notice of the *Seeds*.

A *Seed* is that part of a *Plant*, which when committed to the Ground, or fix'd in any other convenient Place, it is enlivened, takes Root, by which it receives Nourishment, and produces a new *Plant*, like unto that from whence it came; for as Earth is said to be

be the Mother of us all, so it is such in a special manner to the Seeds of Plants; which can make no Step or Progress towards the Propagation of the Species, until being buried in the Ground it there dies, and a new Plant takes Life as it were, or sends forth its *Fibres* on purpose to receive a competent Supply of Nourishment, and so propagates the Species: For as we are told in *Genesis*, that the *Herb bears Fruit whose Seed is in it self*, so St. *Paul* tells us in the *Corinthians*, that the Seed which is sown must die, before the Plant to be produc'd by it can take Life, *but God*, says he, *giveth it a Body as it hath pleased him, to every Seed his own Body*.

There are the *Seeds* of some *Trees*, which falling in betwixt the Clefts of a *Rock* where there is scarce any Earth, the Tree will there take root and grow; and I have observ'd how the *Viscum* will not take root in the Ground, but by the placing of its *Berry* upon some other Tree, it grows, and is propagated there: But be that how it will, the Earth, either mediately or immediately, furnishes Nourishment to all kinds of Vegetables. It may be said indeed, that the *Lithophytæ* do not receive their Nourishment from the *Earth*, but from *Rocks* and *Stones*; but it can be answered, that even the *Rocks* and *Stones* are *Earth* to such Plants in that respect; and to several other *Sub-marine Vegetables* of a softer Texture than they are.

The

The *Seeds* of Plants are either *Nuda* or *Capsulis inclusa*. Some have a great Difficulty in admitting of those commonly called *Semina Nuda* or *Naked Seeds*; and therefore the *Naked Seeds* by such are thus defin'd; *viz.* That a *Naked Seed*, properly speaking, is that whose *Seminal Leaves* are only covered with a proper or a single Coat, and no more, according to that of *Cæsalpinus*, "That in all *Seeds* there is a certain
 " fertile Humour or Substance, which if it
 " perish, or by Age or any other Accident
 " it is render'd fruitless, no Plant can be propagated from it: Therefore to prevent
 " such Inconveniencies, Nature has provided
 " each Seed with its proper Coat, with
 " which it's constantly involv'd till it begin
 " to *Bud*." That it's necessary that every *Seed* should be endow'd with its proper Coat is what shall not be deny'd; but why, because it has another loose Coat still to preserve the *Germen* of the *Seed* from external Injuries, it should not be called *naked* I see no reason; *v. g.* *Pease* and *Beans* are *Capsulis* or *Siliquis inclusa*, yet every one of them have an outer and inner Coat; and because of that, shall not these be call'd *Naked Seeds*? That's going a little too nicely to work: though I think Mr. *Ray* is too much upon the Reverse, when he says, that he accepts of the

^a Knaut. de Method. p. 26.

whole *Fruit* for a *Naked Seed*. *Tournefort* says, he distinguishes betwixt the *Shell*, and the *Seed* contain'd within the *Shell*. "But, says Mr. *Ray*, "if no *Seed* can be look'd up-
 "on as naked, except that which has a sin-
 "gle, yea, a double *Coat*, there is no such
 "thing upon *Earth* as a *Naked Seed*^b". Now that there are *Naked Seeds*, which have only one *Coat* from the *Frumenta* or eatable Grains, as *Wheat*, *Barly*, *Rye*, is plain, unless you'll call the *Gluma* the *Chaff* a *Capsula*, and we know that *Barly* has but little of that: again, I am willing to admit of all the *Umbelliferæ* having *Naked Seeds*, though *Tournefort* says of some of them, that they have *Semina involucrum deponentia*; but I will not so easily accept of the *Agrimonia* and *Circea*, as having *Semina Nuda*, even although with Mr. *Ray* they be class'd among the Plants *Seminibus Nudis Solitariis*, whereas he owns, that *Agrimonia* has *Vascula Lappacea, duo semina plerumque continen-*
tia: now in this Case, *Agrimonia* can neither be said to have a *solitary naked Seed*, nor one *single Seed* to succeed to each *single Flower*. *Morison* in his *Hist.* and *Hallucinationes*, would have *Circea* and it class'd together, because they have *Semina Verrucosa*: he means, they have a rough *Capsula*; and *Flora Batava* reckons the *Circea*

^b Ray Meth. Emend. p. 126.

among the the *Angiospermæ*, and the *Agrimonia* among the *Monocarpæ*^c; so that with respect to the Fruit both may be class'd together, but none of them can enter among the *Semina Nuda solitaria ad singulos Flores*: Some of the *Trifoils*, as *Trisol. Pratense Purpureum*, are *Monospermæ*; but it is look'd upon as a *Capfular* Fruit, as are all the other *Trifoils*, *Lotus*, *Melilotus*, *Medica*, &c. and although both *Fruit* and *Seed* fall together, yet such *Trifoils* as are *Monosperma*, cannot be said to have a *naked Seed*, according to that of *Rivinus*, speaking of *Fumaria*, “ And
 “ indeed, says he, its *Seed* may seem to be *na-*
 “ *ked*, because it does not throw off its Cover
 “ of its own accord, although it be very ripe
 “ when it falls; as the *Melilotus minima fructu*
 “ *renalis seu reniformis nigro*, is not said to
 “ have a *naked Seed*, although after the same
 “ manner the *Seed* falls down with the *Husk*;
 “ so that here they do not err, who strictly
 “ examining the *Fumaria*, shall reckon it a-
 “ mong the *Siliquous Plants*, when each sin-
 “ gle *Silicula* contains a single *Seed*^d.” And
 Mr. Ray,

^c Ex *Circis* & *Agrimoniis* peculiare genus componi nempe unicapsulare dyspermum & generi plantarum unicapsularium subungi non videtur adeò incongruum. Flora Batav. p. 206.

^d Et sanè semen fumarix plerisque videbitur nudum ideo, quia suum sponte non exuit involucrum quamquam satis maturum decidat. Quemadmodum verò *Melilotus*, e. g. *Minima fructu renali nigro* non dicitur semina gestare nuda quamvis eodem modo suum cum integumentum demittat semen

Mr. Ray, in his *Methodus Emendata*, says of *Malva*, That in his *Nova Methodus*, and in his *History of Plants*, he had class'd it with the *Gymno-Polyspermæ*, or those Plants which have many naked *Seeds* together, not through Ignorance, because he took the *Seed Vessel* for the *Seed*, as *Tournefort* alledges; “ for I
 “ know, says he, that *Cæsalpinus* attributes
 “ a *single Husk* to each *single Seed* of the
 “ *Malva*, and by that distinguishes them
 “ from *naked Seeds*, as appears from the
 “ *Synopsis* of *Cæsalpinus*, his *Method* annex'd
 “ to the *Nova Methodus*; but that which
 “ Mr. Ray reckoned for a *naked Seed*, what-
 “ ever, when ripe, naturally falls off from the
 “ common Mother or *Placenta* separately,
 “ and that along with the *Capsula* or *Husk*:
 “ But although in this respect it agrees with the
 “ *Gymnospermæ* or *naked Seeds*, yet because
 “ of the Figure of the *Flower*, and its *Pi-*
 “ *stillum*, and that the *Seeds* themselves are
 “ easily depriv'd of the *outer Coat*; as al-
 “ so since it agrees by its emollient Virtue
 “ with the *Alcæa Indica*, he thinks it should
 “ not be separated from it ^e.” In a word,
 though

men ita & hoc in loco non aberrabit qui rigorosius examina unicis illam annumerabit filiculosis quæ singula semina singulis inclusis filiculis gestat.

^e Hanc plantam (malvæ scil.) in methodo meâ & historiâ plantarum plantis gymnospermis polyspermis accensui, non quòd per ignorantiam capsulam pro grano haberem, ut existimat Tournefortius; novi benè Cæsalpinum malvarum seminibus singulis singulos folliculos tribuere, & a seminibus nudis

though I should be unwilling to deny such as have formerly been receiv'd for *naked Seeds*, to be class'd among the *Gymnospermæ*, in order to avoid Confusion, yet I do not think those who have a *Capsula* or *Siliqua*, should, without sufficient ground, be admitted among the *naked Seeds*, when the contrary is plain, and when by so doing, such and such a *Species* must needs be separated from its *Congeners*, which are *Capsular*, as in the former Examples of the *Trefoils* and *Melilotes*, as also the *Malva's*, whose *Capsula* are very plain.

Vasculum Seminale or a *Seed Vessel*, is either called *Capsula* or *Siliqua*. These are often us'd reciprocally to signify the same thing; but in my Opinion they signify two different things, or at least a *Siliqua* may be called a *Capsula*; but there are *Capsulae* which are not *Siliquæ*. Both are otherways term'd; *Vasculum Seminale*, *Conceptaculum* and *Involucrum Seminale*, or *Seminis Folliculus*, *Theca*, &c.

dis ea distinguere, ut patet ex synopsi methodi Cæsalpinianæ quam methodo meæ stirpium novæ, 1682 editæ subjunxi; sed quòd pro seminibus nudis habuerim quæcunque per maturitatem à matribus suis singulatim sponte separantur & abscedunt, ut alibi latius exposui. Verùm quamvis hoc respectu cum plantis gymnospermis convenit, quoniam tamen floris formâ, ejusque pistillo, & seminibus ipsis, exteriori integumento, & foliis, totiusque plantæ habitu, quin & vi emolliente cum Alcæa Indicâ convenit, minimè ab eâ separandum agnosco, secundum regulam mihi met ipsi & aliis præscriptam. Raii Meth. Emend. p. 86.

I therefore look upon *Tournefort's* Definition of a *Capsula* to be too general, when he says, it's a *Theca* or *Cover* to the *Seed*, whether it be gross or small, hard or soft. I rather take a *Capsula* to be a *membranous*, *short* or *round Vessel*, containing the *Seed* till 'tis ripe; and either opening of its own accord, and shedding the *Seeds*, as *Nicotiana*, *Hyoscyamus*, *Antirrhinum Delphinum*, *Scrophularia*, &c. or carried along with the *Seed* it self, as we have observ'd in the *Fruit* of the *Malva*; and these are either *Singulares*, or when one *Capsula* succeeds to each *Flower*, as in the foregoing Examples; or in *Capitulum Congestæ*, as *Aquilegia*, *Helleborus niger*, *Caltha palustris*, &c.

The *Capsulæ* are considered, 1. In respect of their *Structure*; in which case they are either *Simple* or *Compound*.

The *simple Capsulæ* are those which have one *Cavity*, in which the *Seeds* are contain'd, as in the *Caryophyllus*, *Lychnis*, and all the *Flores Caryophyllæi* of *Tournefort*, *Primula veris*, *Auricula Ursi*, *Anagallis*, &c.

The *Capsulæ compositæ* are distinguished according to the Number of the *Loculamenta* or *Pouches*; thus they are *Bicapsulares* or *in duo Loculamenta divisi*, as *Lysimachia*, *Sedum bicornis*, *Verbascum*, *Blattaria*, &c. *Tricapsulares*, as *Lilium*, *Tulipa*, *Iris*, and all that *Class* of the *Flores Liliacei* of *Tournefort*, *Tetra-capsulares*, or divided into four

Pouches, as *Ruta*, *Stramonia*. This *Ruta* is justly observ'd in the *Flora Batava*, to be *interdum Quinqucapsularis*, as *Geranii Species*, each of which contain only one single *Seed*; and therefore may be said to have *Semina Nuda*, as well as *Agrimonia*. There are other *Pentacapsular Plants*, whose *Pouches*, containing several *Seeds*, open with an *Elasticity*, and disperse the *Seeds* with force, as *Balsamina Fœmina*, *Trifolium Acetosum*; *Ketmia* also, though it have a mallow Flower, may be justly reckoned among these *Multicapsulares*, as well as *Aristolochia*. I do not incline, as others do, to reckon the *Papaver* among these, because it has several *Placentæ* or *Lamellæ*, in which (running longitudinally) the *Seeds* are lodg'd; but they are not distinct *Loculamenta* or *Pouches*, and therefore *Papaver* is only an *Unicapsular Plant*. Several of these *Multicapsulares* may also be called *Multisiliquæ*, as having several distinct *Pouches* or *Pods*, not separated from each other by a *Septum intermedium*, but are plainly *Bivalves*, as most of the *Siliquæ* are, each consisting of a proper membranous Coat, and opening longitudinally; and these being in *Capitulum Congestæ*, as has been already observ'd, may either be *Multisiliquæ* or *Multicapsulares*, as *Sedum*, *Aquilegia*, *Helleborus*, *Pæonia*, &c.

2. *Capsulæ* may be considered in relation to their *Substance*; in which respect they
2
may

may be divided into *Carnosæ*; as the *Pomiferæ* and *Membranaceæ*; but this Distinction can scarcely be admitted, because however the *Capsular* Fruit may be called *Parenchymatous*, yet the *Capsulæ* are still *Membranaceous*, consisting of firm, hard, tough, membranous Sides, capable to support the heavy Load of *Parenchyma* or fleshy Substance, in which they are lodg'd, and which rest upon them.

3. In respect of the Number of Seeds they contain; as *Capsulæ Monospermæ*, having only one Seed, as in some or most of the *Trifolids*; *Dispermæ* as *Agrimonia*; *Tetraspermæ*, or *Gymno-Tetraspermæ* of the *Flora Batava*; as in the *Labiata*, such as *Lavendula*, *Hyssopus*, *Salvia*, &c. and *Asperifoliæ*, as *Borrago*, *Buglossum*: And here it may justly be questioned, whether these may be called *Capsula's*, or only *Vascula seminalia*, because I look upon a *Capsula* to be close shut up till the Seed is ripe; and here the Vessel is always open, though *Tournefort* is pleas'd to call these *Capsulæ quæ Floris calices fuerunt*: And *Polyspermæ*, when there are many Seeds contain'd in one *Capsula*, whose Number is indefinite.

The *Capsulæ* have belonging to them the *Septa intermedia*, and the *Placentæ*. The *Septa intermedia*, are as it were *partition Walls*, running from the one side to the other, and dividing the *Capsula* into several

Apartments, called *Loculamenta* or *Pouches*; and upon that account it is that they are called *Bicapsulares*, *Tricapsulares*, &c.

The *Placentæ* are certain Substances to which the Seeds adhere, and from whence they receive their Nourishment: Sometimes they arise from an *Axis medius*, or an *Axle-tree*, (called by the *French Pivot*,) fram'd by the Conjunction of the three *Septa*, which meet in the *Center*; and to this *Axis* is fix'd the *Placenta*, which occupying the middle Cavity of each of the *Loculamenta*, is there loaded with Seeds on all sides, as in the *Campanula*. Each of these *Loculamenta* open either at the top or *longitudinally*, as the *Seeds* ripen, and separate from the proper *Placentæ* or *Seed-beds*. Sometimes the *Placenta* occupies the Center of the *Unicapsular* Fruits; and these generally open transversely when the *Seeds* quit their hold, and are ripe, as in the *Anagallis*; and sometimes they arise from the sides of the *Capsula*, and run towards the Middle; but not meeting in the Center they are only *Unicapsular*, as in the *Papaver*; though the *Flora Batava* calls it *Multicapsular*, because of the several longitudinal *Lamellæ*, to both sides of which the Seeds adhere, and are pour'd out, when ripe, at so many Holes at the top, (covered with an *Operculum* or *Lid*,) as there are *Intersections* by the *Lamellæ*, which scarce happens to any other *Unicapsular Fruit*; upon which account

I sup.

I suppose it is, that *Herman* did not think it fit to reckon it among the *Unicapsulares*.

I next consider the *Siliquæ* or *Pods*. These are long, round, or flat *Seed Vessels*, each containing one or two Rows of Seeds; some are *Bivalves*, *i. e.* divided longitudinally into two Parts, opening at the one or fore-side, and having the *Seeds* adherent to the other, as in the *Chelidonium majus* and *Glaucium*, or *Papaver Corniculatum*; wherefore I think they ought to be disjoin'd from the other *Papavers*, notwithstanding of the *Perianthium Bifolium*; others are *Univalves*, as *Clematis Daphnoides*; Some are *Lanuginosæ*, as *Asclepias*, *Acocinium*; and others *Tetracapsular*, and *Quadrivalves*, as *Chamenerion*, &c. Most of that Genus of Plants called *Flore Cruciformi donatæ* of *Tournefort*, and the *Tetrapetalæ* of other Authors, are either *Siliculosæ* or *Siliculosæ*; and all the *Leguminosæ*, or *Flore Papillonaceo donatæ* are *Siliculosæ*.

The *Siliquæ* are likewise considered as to their *Articulations*; so they are either *Siliculis planis* or *Articulatis*, as *Rapistrum siliqua plana*, and *Siliqua Articulata*: Also among the *Papillonaceous Flowers*, there is *Pisum* with a *Siliqua Plana tumida*, *Phaseoli Siliqua Compressa*; *Ornithopodium*, *Orobis*, *Siliqua Articulata*.

N. B. *Articulus* in *Botany* signifies several *Joints* or *Knots*, by which one part of the

Pod is distinguish'd from another, as if they had been formerly join'd together, as in *Securidaca*.

There are likewise *Siliquæ Cochleatæ* and *Falcatæ*, as the *Medicas*. These are seldom or never called *Capsulæ* but *Siliquæ*, because of their being *Bivalves*.

I may also reckon among the Fruits, the *Capita* or Heads of the Plants, because they contain a great many *Seeds* within one *Theca* or Cover; such as the *Capitatæ*, as *Carduus*, *Cinara*, *Jacea*. These having a *Pappo* or Down, are called *Papposæ*. The *Corymbiferæ*, which are *non Papposæ sed seminibus solidis*; and these are either *Nudæ*, as *Tanacetum*, *Absynthium*, *Abrotanum*, &c. called by Tournefort *Flore Flosculoſo Corymbiferæ Radiatæ*, as *Calendula Bellis Flore Semiflosculoſo*; *Papposæ*, as *Hieracium*, *Dens Leonis*, *Tragopogon*, &c. *Non Papposæ*, as *Cichoreum*, *Endivia*, &c.

A *Pappo* or Down is a soft Substance, consisting of a great many small *Villi*, or Hairs, join'd together, contain'd in the Head or Fruit of a Plant, sometimes separated from the *Seeds*, as in the Hips of the *Roses*, and in all the *Capitatæ*, as *Carduus Cyanus*; and sometimes it is adherent to the *Seeds* themselves, as in *Tragopogon*, *Dens Leonis*, for which they may be called *Semina Alata*, to be distinguish'd from the *Semen Barbatum* of the *Carduus Benedictus*.



BOTANICK ESSAYS.



ESSAY III.

Of the different Methods of disposing Plants.



TO distribute or dispose of Plants into a *Method*, is to rank or *Class* them, as Dr. Morison justly expresses it, according to their *Cognationes* & *Affinitates*, i. e. when upon strict Observance of the several Parts of the *Plant*, they find that one, two, or more of their most *essential Parts* agree together in their *Notes* and *Characters*, and that these *Notes* do not vary, but are unchangeable in all Plants
rais'd

rais'd from the same Seed, or sprung up from the same Root.

Before I attempt to consider that *Method* it self, and its several Distributions, according to the different Authors, I shall first shew what a *Note* is.

A *Note* is two-fold, either *Characteristick* or *Distinctive*. A *Characteristick Note* is a certain constituent part of the *Plant*, which never alters, but is so fix'd, that all other Plants which have that part of such a Frame, or such a Figure, situated so and so, and dispos'd after such a manner, may be justly class'd together, v. g. The *Characteristick* of an *Umbelliferous Plant*, is to have a small *Pentapetalous Flower*, to which succeed two Seeds firmly united together when green, and easily separating from each other when ripe; and all *Plants* (however their *Flower* may be dispos'd upon the top of the Stalk and Branches, and whatever be the Figure of their *Leaf*) that have these Characters of the *Flower* and *Fruit*, are still *Umbelliferous*: For if the Disposition of the *Flower* were requir'd, then the *Tanacetum*, which is a *Corymbiferous Hedera Arborea*, *Sambucus*, *Ebulus*, which are *Bacciferous*, would be *Umbelliferous*, *Plants* also, because all of them have several small *Pedicles* arising from them, and situated upon the top of the common *Stalk* and *Branches*: *Quadam veluti circinatione Corymbi vel Umbellæ (qua Mulieres*

Mulieres solem à Vultu arcere solent) *ad-*
instar dispositæ ^a. “ dispos’d in a Circle, mak-
 “ ing the Figure of an *Umbrella*, which Wo-
 “ men carry above their Head to guard their
 “ Faces from the Heat of the Sun, or in a rainy
 “ Day. Neither is it because they have *Folia*
Lobata, *Pinnata*, or *Plurifariam divisa*, for
 several other Plants are so too. The *Characte-*
rystick Note of a *Planta Spicata* & *Verti-*
cillata is, that it have either a *Helmet*, or *Lip-*
flower, and four *Seeds* to succeed each of them.
Euphrasia may be call’d a *Planta Spicata*, by
 the *Disposition* of the *Flower*, and a *Planta*
Labiata, because of its *Figure*; but it can-
 not be join’d in with the other, because it
 has a *Capsular Fruit*; *Borrago* and *Buglos-*
sum have four *Seeds* to each *Flower*, but it
 cannot be join’d with the *Verticillatæ*, be-
 cause their *Leaves* are dispos’d in *Pairs*,
 and the *Leaves* of these are *alternately* plac’d.
 Their *Flowers* have *unequal*, but the *Flowers*
 of These have *equal*, *Segments*.

A *Distinctive Note*, is that by which two
 Plants, having the same *Characterystick Notes*,
 are distinguish’d from each other, v. g. *Meum*
 and *Fœniculum* agree, in their being *Umbel-*
liferous Plants, with fine deep cut, dark
 green *Leaves*, and a long *striated Seed*;
 but their *distinctive Note* is, that *Fœniculum*
 grows much higher, has *longer Segments*, yel-

^a Tournef. Institut. R. H. p. 304.

lowish Petala, bending upwards; *Meum* has a *perennial*, (most of the *Fennels* are annual, or *biennial*) bearded *Root*; *Bupleurum* and *Perfoliata*, have undivided Leaves, in which with the other *Characteristicks* they agree; but their *Distinctive Note* is, that the Stalk *perforates* the *Leaf* of the *Perfoliata*: *Libanotis*, and *Laserpitium* agree in all their *Characters*, having the same *Flower dispos'd* after the same manner, with the same *semina Rotæ molendinariæ forma*, as Dr. *Morison* justly compares them. But their *Distinctive Note* is, that *Libanotis* has *Folia Lobata*, and *Laserpitium* *Folia plurifariam divisa*.

Knautius lays down this general Rule for constituting the *Characteristicks* of *Plants*, viz. Whatever *Plants* have *Flowers* after the same manner, and produce *Seed Vessels* conform to the *Flowers*, these belong to the same *Genus*, and ought to be design'd by the same *Name*. Thus the *Malva Betonicæ folio* is a *Mallow* by the *Flower*; but its *Fruit*, consisting of several *capsulæ in capitulum congestæ*, according to Dr. *Tournefort*, it is therefore a distinct *Genus* which he calls *Malacoides*; *Alcæa Arborescens* has a *Mallow flower*, but by its having a different *Fruit* divided into several *Loculamenta* or *Pouches*, is deservedly a distinct *Genus*, which *Tournefort* calls *Ketmia*.

The celebrated Mr. Ray lays down the following general Rules for constituting a *Method*.

“ 1. So few Innovations as possible are to
“ be made. The Names of Plants generally
“ receiv’d, frequently us’d in the Writings of
“ Physicians, are not to be chang’d but upon
“ good Grounds, to avoid Confusion.

“ 2. The *Characteristick Notes* of the
“ *principal*, as well as the *subaltern Gene-*
“ *ra*, are to be distinct, clearly, and exactly
“ defin’d, not obscure and indeterminated,
“ whose Signification is uncertain how far it
“ may be extended.

“ 3. That the *Characteristick Notes* be
“ *manifest, obvious, and easily discernible*.

“ 4. Care is to be taken that the *Conge-*
“ *ners*, and these in *Affinity* with them, be
“ not separated; and that Strangers, and such
“ as do not agree in the Notes, be not intro-
“ duc’d into the *Family*.

“ 5. That no more *Characteristick*
“ *Notes* than what is necessary be admitted,
“ and that no more be requir’d than what is
“ sufficient to determinate a *Genus*, lest the
“ Memory be over-charg’d, and that instead
“ of *Characteristick Notes*, a Discription of
“ the whole *Plant* be given.

Things being thus premis’d, we are to con-
sider what are the Parts of the Plant which are
most

most convenient for establishing the *Characteristick Notes*, and how many of them are to be join'd together, in order to constitute a *Genus*.

As to the Parts of the Plants, no doubt the most certain, and such as are least subject to Variation or Changes, are only they which ought to be admitted for *Characteristicks*; and these ought to be the most obvious, and most conducive for the *Preservation* and *Propagation* of the *Species*; Therefore the *Flower* as the most *obvious*, The *Fruit* as most *conducive* for the *Preservation*, and the *Seed* as the Instruments of *Propagating* the *Species*, are the three, which in my Opinion ought more-especially to be regarded. Not that I would have the *Root* and *Leaf* to be neglected, only they ought to amount to no more than *Distinctive*, but not *Characteristick Notes*. Thus we have *Iris Bulbosâ*, and *Iris Tuberosâ Radice*: They are both *Irides* by the *Flower* and *Fruit*, though they differ in the *Root*. *Rubia*, and its Congeners would be still class'd together by their *Monopetalous Flower*, deeply divided into four *Segments*, and two *succeeding Seeds*, though the *Leaves* were not dispos'd like the Points of a *Star*, by which they are called *Stellatæ*; for *Cruciata*, and *Gallium Album*, are as much *Radiate* or *Stellate Plants*, though they have but four *Leaves*, which proceed from the *Stalk*, as they which have six or eight.

eight. *Consolida* and *Cynoglossum*, are as distinct from the *verticillate* and *spiked* kind, by their *Flowers*, as by their *Leaf*; and should a Plant be found with the same kind of Flower preceding four *Seeds*, it might be join'd in with them, though the Leaves were neither rough, nor alternatively plac'd.

So that I am much of *Tournefort's* Opinion in that Case, that two or three Parts may be join'd together to make up a *Genus*, but no more, whereof the *Flower* and the *Fruit*, or either of these join'd with one or two of the other Parts of the Plant, ought to make up the *Character*, v. g. The *Flower-fruit* and *Bulbous Root* can make up the *Iris Bulbosa*, or *Xiphion*, though the *Grass Leaf* were wanting; but if a Plant had a *Bulbous Root*, a *Grass Leaf*, and a *Tricapsular Fruit*, it would not make up a *Xiphion* or *Iris* without the *Flower*, neither could it well be call'd an *Iris*, if it had either a *Pod*, or were *Unicapsular*, though it had the other three *Generical Parts*.

Indeed the *Root* and *Leaf* are very good Auxiliaries, but then they are so variable in most of the *Genera*, that they can never serve to constitute the *Class* without the assistance of other more essential Parts, v. g. A *Bulbous Root* is a very good Mark of *Distinction*, and when it meets with an *Hexapetalous*, or *Monapetalous Flower*, divided into six *Segments*, as in the *Iris*, *Lillies*, &c. When

too it has a *Grass Leaf*, as the *Allium*, *Cepa*, *Porrum*, &c. Then with the *Flower Seed*, and *Seed-Vessel*, it may serve to make up a *Class*, which without them it cannot do; for if we should add all the *Bulbous Roots* together, then several other *Plants* would be *displac'd* from their *Genera*, and after all make up but an uncertain *Class*. The *Bulbous root-ed Crawfoot* would be a Stranger here, for though it has a Claim to come in by the *Root*, yet because of most of its other Parts, it cannot be admitted. *Iris Vulgaris*, *Asphodelus Palustris*, *Arum*, and the *Orchides*, I see not how they can be *Affines* or ally'd to the *Bulbous Roots*, when they have not the least Claim to be of Kindred to one another; for there's none of them that has any Pretence to be nearly related to any of the *Bulbous Class*, unless it be that the *Iris* be of kin to the *Xiphion*. *Asphodelus Palustris* has a Leaf like to the *Iris*, but that's nothing to a *Bulbous Root*; and beside the *Root* of this *Asphodelus* is rather *Fibrous* than *Bulbous*, and what Relation has *Arum* to any of these; by its Flower it resembles the *Aristolochia*, if any; by its Fruit, it comes in among the *Bacciferae*, and nothing but its *knotted Root* can bring it in with the *Bulbosis Affines*. The *Flowers* of the *Orchides* vary much, their Fruit resembles the *Bulbous Class* in nothing but having three Holes to shed forth its Seeds (if that can be call'd a Resemblance) for 'tis for the
most

most part *Unicapsular*; and if a *Note* were to be taken from its *Root*, that would be hidden and not obvious, for you must dig them up in several *Species*, before it can be known whether it be *Radice Palmatâ*, or *Testiculatâ*, and if these *Bulbosis Affines* were admitted to make a *Class* of *Plants*, then they would bring in *Discord* and *Confusion* among other *Genera*. How well do all the *Species* of the *Scrophularia* agree together? But if they shall be respected according to the *Root*, then there happens a *Division* in the *Family*; for *Betonica Aquat.* must be sent a packing, because of its *Fibrous Root*, in *Contradiction* to the other *Species* of *Scrophularia*, whose *Roots* are *knotted*. Nor can it be receiv'd with any other, for it has but a slender *Pretence* to be join'd with *Betonica*, because of a small *Resemblance* in the *Leaf*; so that the *Bulbosis Affines* may be let alone for a *Class*.

The *Classing* by the *Leaf* is as uncertain. I have already shewn how fallible those two *Cardinal Genera*, the *Asperifoliæ* and *Stellatæ* may prove, and if these are scarce to be admitted, much less any other. Should all these who have undivided *Leaves* be join'd together, what a *Confusion* would that make? *Ranunculus Gramineo*, and *Plantaginis Folio* would be sent off and join'd with the *Plantago aquat. major* and *minor*, which though they be by some reckon'd *Ranunculi*, yet they differ from the other, especially

in the *Tripetalous* Flower. *Papaver Hortense* would be separated from the *Papaveres Erratici* and *Argemone's*, because it has a whole, and they deeply divided Leaves, and so in a great many others. If they are to be class'd according to the Disposition of the Leaf, then *Hypericon* might be join'd with the *Plantæ Flore Labiato* of *Tournefort*, because both of them send forth their Leaves by Pairs, and several of the *Umbelliferæ* might be join'd with the *Asperifoliæ*, because their Leaves are alternatively plac'd, &c.

So likewise the Disposition of the *Flower* is uncertain. I have shewn that its not because several little *Pentapetalous Flowers* are dispo'd in a Circle upon the top of the *Stalk* and *Branches*, that a Plant is *Umbelliferous*; for then would *Perfoliata*, *Sanicula*, *Eryngium* be dis-join'd from the *Umbelliferæ*, and so would *Hydrocotyle* of *Tournefort*; but if two Seeds, succeeding to each small *Pentapetalous Flower* are to be admitted as *Characteristick*, as they are by the common consent of all Authors, especially if several of them be join'd in a *Capitulum*, whether with or without Pedicles, then they have the *Flores Circinato dispositi*, and *Pediculis donati*, and the *Folia Lobata*, *Plurifariam* and *Multifariam divisa*, and *Fœniculacea*, all which were much look'd after in former Times among the *Umbelliferæ*.

Nor

Nor are the *Corymbiferous Plants* a more certain *Class*, because of their *Disposition in Corymbum*, like the *Bacca Hederæ*, for at that rate none would be reckoned a *Corymbiferous Plant*, except *Tanacetum*, *Millefolium*, *Helichrysum*, and some others; but when by a *Corymbiferous Plant* is meant a *Floscular* or *naked Flower*, consisting of a great many small *Flourishes*, to each of which succeeds a *solid*, not *pappous Seed*, or a *Radiate Flower*, whose *Corona* or *Radius* consists of half *Flourishes*, and *Discus*, *Umbo*, or *middle part* of the *Flower* has *Flourishes*, and a *solid*, not *pappous Seed*; then that *Class* is determined, whether the *Flowers* are all plac'd upon the top of the *Stalk*, or only proceed from the *Spikes* of the upper part of the *Stalk*, as *Absynthium*, *Abrotanum Mas*, *Artemisia*, &c. 'tis all the same. And here the *Division* of the *Leaf* would serve to no purpose; for I look upon *Balsamita Mas*, call'd by *Caspar* and *Johannes Bauhinus*, *Mentha Corymbifera*, as a *Tanacetum*, though the one has a *divided*, and the other an *undivided Leaf*, since they agree in the *Structure* and *Disposition* of the *Flower* and *Dracunculus hort.* five *Trachon.* J. B. to be an *Abrotanum* for the same Reason. It is difficult to determine wherein the *Distinction* betwixt *Absynthium*, *Abrotanum* and *Artemisia* lies, though they are truly distinct *Genera*, having the same *Flower*, and

dispos'd after the same manner too ; and yet Dr. *Tournefort* seems to have been in the right to join the *Trachon* to the *Abrotanum*, rather than to any of the other two.

Mr. *Ray* expresses himself handsomely on this account : “ He justly owns, that it’s
 “ most difficult to distinguish *Absynthium*
 “ from *Abrotanum*, by certain and proper
 “ Notes, which are competent to all the
 “ Species *Absynthii*, and to none of the *A-*
 “ *brotana* ; for 1. It is not the excessive Bit-
 “ terness which is peculiar to several of the
 “ *Absynthia* that will do it ; for there is an
 “ *Absynthium insipidum*, and there are several
 “ of the *Abrotana* that are as much
 “ bitter as the *Absynthia*. It’s not, 2. the
 “ whitish Colour of the Leaf, for there are
 “ some *Abrotana* which have whitish Leaves,
 “ as *Abrotanum mas*, *Augusti folium mas* : B.
 “ Nor 3. the woodiness of the Stalk, which
 “ is more peculiar to the *Abrotanum*, for
 “ there are also some Species of the *Absyn-*
 “ *thium* which are woody, as *Absynthium*
 “ *Arborescens*, *Lob.* Neither is it 4. the
 “ the Division of the Leaf into larger and
 “ less Segments, for there are Species of
 “ both which have very small Segments,
 “ and finely divided (though this is not re-
 “ ciprocal, for none of the *Abrotana* have
 “ their Segments so large as the *Absynthium*
 “ *vulg. Latif.*) Therefore Mr *Ray* observes,
 “ with Dr. *Tournefort*, that there is some-
 “ what

“ what in the Habit of the Plant (*Gallice*
 “ *Le Port*) by which *Absynthium*, *Abrota-*
 “ *num*, and *Artemisia* are distinguish’d from
 “ each other ^b. *Tournefort* says, *Artemi-*
 “ *sia differt ab Absynthio solâ facie exter-*
 “ *na; nam florum discrimen oculos pene fugi-*
 “ *unt* ^c. I may likewise add, that the *Flo-*
res Penduli, and *Calix Sphæricus* will not do
 to all the *Absynthia*, for *Absynthium Mari-*
num, has erect Flowers, and an oblong *Ca-*
lix, like the *Artemisia*, but there is some-
 what in the *Foliorum Divisura* which can-
 not be express’d, and yet by which ’tis easy
 to distinguish *Artemisia* from its *Congeners*
Absynthia and *Abrotanum mas*. The like is
 also observable in the *Adiantum nigrum of-*
ficinarum, which has some unexpressible *Di-*
visions and *Striæ* in the *Leaf*, by which its
 distinguish’d from some of the *small Filices*
Saxatiles, which it otherwise very much re-
 sembles. *Abrotanum Fœmina*, or *Santolina*,
 is easily distinguishable from its *Congeners*,
 if it were but by a single, large Flower, up-
 on each single *Stalk*, though *Mr. Ray* brings
 in *Dr. Tournefort* as using the (*Leport*) *Plan-*
tæ habitus, as a Note to distinguish it from
 the rest.

Mr. Ray brings in the *Corymbiferis Affines*
 and *Capitatae*, as two distinct Genera from
 the *Corymbiferae*. I would rather chuse with

^b *Raii Meth. Emend.* p. 37. ^c *Turnef. Institut.* 460.

Dr. Tournefort to bring them all in among the *Flores Flosculosi*, and then distinguish them by the *Seminibus Papposis* and *non Papposis*. For all of them have the *Flosculi Fistulares*, though the *Scabiosa* and *Cyanus* differ from the other *Flores Flosculi* in the Figure and *Equality* of their *Segments*.

I'm not very fond of *Lactescent* as a *Characteristick Note*, to constitute a Class, for then the *Tithymalls*, *Campanula's*, *Rapuntiums*, &c. might be brought in; and altho' *Pappescent* too be added, that's not sufficient, for then there would be room for the large *Genus* of the *Apocynum's*, which none will pretend to class with *Hieracium*, *Dens Leonis*, *Sonchus*, &c. So that I think Dr. Tournefort was in the right for joining all the *Flores Semiflosculosi* or *Flowers* with *half Flourishes* together, and then he had a good Opportunity to distinguish betwixt those which had *Semina Papposa* and *non Papposa*, for that of *Flore Composito* is too general, and capable of too many *Sub-divisions* to render the Method of distributing Plants succinct and easy to be understood.

To sum up what has been already said concerning the manner of distributing *Plants* according to their several *Genera* and *Species*, by their *Characteristick* and *Distinctive Notes*. As there is a *Necessity* of joining two, three, or perhaps more of these *Notes* together, to render the *Plants* the more intelligible

telligible, and make the Knowledge of them be the more easily acquir'd, so it is most difficult to be determinate which of them are fittest to be receiv'd as *Characteristicks*, and which as *Distinctive*; for in treating of *Plants* now-a-days, *Authors* are not to chuse the easiest *Method* for themselves, in order to make the Description of one Plant follow another, as some do it *Alphabetically*, that they may not be render'd uneasy in assigning to each *Genus* the *Characteristick*, and each *Species* its *Distinctive Note*. Others according to the Seasons of the Year, that they may describe the first *Plant* that comes to hand without Distinction, as *Beslerus* did when he gave those elegant Figures of *Plants* in the *Hortus Estitensis*, or according to their Virtues, that they may heap up confusedly together, those that are good for such and such a Distemper, whether they be so or not; as *Parkinson* in his *Paradisus Terrestris*, and *Theatrum Botanicum*; or according to the *Facies Externa*, and *Plantæ Habitus*, as *Matthiolum* in his *Commentaries* upon *Dioscorides*. But Authors are now to chuse the most intelligible *Method* to teach others (and not to please themselves) by laying down some of the principal Parts of the *Plant* as *Characteristick Notes*, and then *dividing* and *sub-dividing* all those which partake of such and such a *Characteristick*, into their several *Genera* and *Species*, according to these call'd *Distinctive*

Notes, v. g. If the *Flower* be *Characteristick*, then the *Fruit* or *Seed-Vessel* and *Seed* must constitute the *Genus*, and the other less material Parts, such as the *Root*, *Stalk* and *Leaf*, must be considered, in order to make up the several *Species* belonging to such a *Genus*. If the *Fruit* or *Seed*, and *Seed-Vessel*, be the *Characteristick*, then the *Flower* and other Parts must be had Recourse to for Distinctions sake; and if the *Root* and *Leaf* be look'd upon as such, then the other Parts of the *Plant* must be subservient to them.

And herein it is that the great Contest among Authors lies, what Number of Parts, and which of them shall be look'd upon as *Characteristick*, &c. every one joining one or more of them together, as their Humours and Fancies lead them, by which they have multiply'd *Methods* so fast in a short Time, that if *Botanick* Writers go on at this rate, e'er it be long they shall render *Plants* as unintelligible by *Method*, because of their great Plurality, as formerly it was to know the *Plants* without *Method*. But would *Authors* from henceforth observe the following Rules, I persuade my self such vast Inconveniencies would be prevented, and that delightful Science of *Botany* would be farther advanc'd. The *Students* of it would not be so much discourag'd, and others might be persuaded to betake themselves to that laudable Study, which
carries

carries so much Innocence and Simplicity along with it, which yields so much Pleasure and Satisfaction to those who pry into it, and which affords Matter of so much curious Speculation, that it's pity any such Obstruction should be made to its Progress, by the Mismanagement of those who ought rather to be instrumental in its Propagation.

1. Then it were convenient, that all the Writers upon that Subject would cease to treat one another undecently, by reflecting upon their Knowledge, or accusing them of Unskilfulness, (because they have fail'd in their Observation, and have not come up to that Nicety in describing of a Plant as another) which only serve to raise Disputes, and be a Means of Altercation and Strife, rather than of searching after the Truth.

2. Since 'tis acknowledg'd by all, that the *Flower, Fruit, Seed* and *Seed Vessel*, are the most essential Parts of the *Plant*; and that there are *Methods* enough already establish'd, into which *Plants* have been dispos'd according to their *Characteristick Notes*; it were convenient that none would give themselves the trouble, or rack their Brains, to find out any new *Method*, wherein to dispose of Plants, different from what has been laid down: But by being sedulous in making of new Observations, that they would impartially correct and amend what they find amiss in the former *Methods*, by altering the *Titles* where

where they find a *Discrepancy*, adding to the *Characteristicks* where there is a real *Deficiency*, and sometimes transposing of *Plants* when they find them misplac'd; but still with a due Deference to the Founder, who should always have the Honour of the Name of the *Method*, because he was at so great Pains to class them first together in such a manner; v. g. Mr. Ray once class'd *Arum* among the *Bulbosis Affines*^d, as has been observ'd; after that he more justly join'd it to the *Bacciferae*^e; but since he has plac'd it among the *Fructu magis sparso*, it were convenient to remove it from thence, and with its *Congeners*, *Dracontium*, *Arisarum* and *Colocasias*, make up a new Title, viz. *Bacciferae Fructu Aggregato sive Coacervato*, in contra-distinction to the former. Now this may be done without any Prejudice to the *Method*, and yet be of more use to the Reader; for tho' in the *particular Note* of *Arum*, it is said to have *Fructum è baccis Coacervatis*, yet since this is contradictory to the Title, 'tis convenient that such be rectify'd, because Readers often rely upon what is contain'd in the *Title*, without being at pains to examine the *Notes* belonging to each particular *Genus*, and so may be led into a Mistake: So that whether the Design of the *Method* be to class

^d Synops. Stirp. Brit. p. 234, 235.
& Auct. p. 75.

^e Meth. Emend.

the Plants by the *Flower*, and distinguish them by the *Fruit*, or to class them by the *Fruit*, and distinguish them by the *Flower*, there may be still work enough for the curious *Botanist* to alter the *Titles* of the *Genera* themselves, rectify the *subaltern Genera*, and render the *Characters* of any particular *Plant* more obvious, without prejudice to the *Method* it self, by pulling it down, that another may be built upon its Ruins, or doing what may reflect upon its Author, which I am sorry should be so frequently done.

3. That special Care be had not to invent new Terms of Art, establish new *Genera*, nor deprive any *Plant* of a long-receiv'd Name, upon any trivial Pretence; but what needs must, in order to rectify gross Mistakes: For the unnecessary *Multiplication* of these, is ready to create a Confusion, and puzzle the *Botanick Student*, upon every slight Occasion.

Therefore all Endeavours should be us'd, to find out a proper *Genus*, already established, to which such and such a Plant may be referr'd, and with which it may agree in the Character: And I'm convinc'd, if this were rightly observ'd, there would not be so many *Plantæ sui generis* or *incertæ sedis*, nor so many *anomalous* Plants, as are frequently pointed out to us by Authors.

Having thus premis'd what I thought convenient, to make it be understood what is meant

meant by *Method*, I shall next proceed to give an account of the Origine and Progress of it.

I have already shewn what might have been the Ground-work upon which Dr. *Morison* built his Method, and what might have been the Means of setting him to work, in correcting the Errors of others, and in establishing a new one of his own; which has been a Pattern to all those who have writ upon Method ever since. And I'm sorry to find some, otherwise good, learned, and ingenious Persons, at so much pains, to calumniate, inveigh against, and detract from that great Man, those due Praises he justly deserves; as being the chief Author, I may justly say Founder of so great an Undertaking, as that of the disposing of Plants into a *Method*; and to reflect so much upon his Memory after he was dead, and not able to answer for himself.

I'm likewise much concern'd, that one who by his unfortunate and untimely Death, (which happen'd *non sine insigni Rei Herbariæ jacturâ*, as *Ammannus* justly expresses it^f) has arriv'd at the highest Pitch of *Honour* and *Glorry*, by the Improvements he made, and *Correspondence* he has kept with the greatest *Botanists* in *Europe* ever since, should not have rested contented with the *Spolia* of his Com-

^f Amman, Charact. Plant. Genuina. Præf. p. 10.

petitor, but throughout the whole Course of his Life, and even when it may be said, that one of his Feet were in the Grave, and the other following, according to the Proverb, continu'd to rake into his Ashes, and to commemorate his Imperfections (which in a Christian way ought to have been buried in oblivion) after a most barbarous, undecent and inhumane Manner; as is to be seen in the Margin, and which will not bear a Translation^s; and all this because *Cæsarve priorem Pompeiusve parem.*

Dr. *Morison* had spent a great deal of his Time in observing of the Plants themselves: by the Encouragement of the *Duke of Orleance*, his *Patron*, had bestow'd much Money in procuring a great many foreign and rare Plants; did by indefatigable Pains, Industry and Labour, traverse, search after and obtain, from all the Parts of *France*, such a Quantity

*Morison's
Method.*

^s Hac re graviter offensus D. Robertus Morisonus Aberdonensis Scotus M. D. veritus fortasse ne quid famæ suæ & auctoritati (quem non mediocrem inter Botánicos nec immeritò sibi comparaverat) editis speciminibus methodi illius quam se non libris hausisse sed à natura ipsa edoctum fuisse *gloriabatur*, deccederet; meque in messem suam falcem immittere ægrè terens, tabulas illas tacito auctoris nomine indignis modis laceravit. Ego quamvis methodum illam reprehensionì obnoxiam, nec tantùm imperfectam sed in multis vitiosam fuisse agnoscerem, cum tamen viderim me *ab homine aithades* sui que pleno ne quid durius dicam aut manes ejus inquietem, contemptum & ludibrio planè habitum, ut existimationi meæ aliquatenus consulerem, tentare statui quod naturæ ductum in plantis digerendis & methodo instituendâ possem. Præf. ad Meth. Emend.

of

of *indigenous* Plants, as to make up a large Catalogue in five Years time, of which there were 260 *non Descripts*. He was also indefatigable in turning over and consulting of ancient Authors, thereby finding out what made for his Purpose, and detecting of their Errors, by which he compos'd those notable *Hallucinationes*, now so much decry'd and enveigh'd against, because of the unusual Title, *Hallucinatio*; though that now so much despis'd Treatise, was the first which gave so much Insight to those who afterwards gain'd so much Fame, and who notwithstanding of what they obtain'd by it, did ever continue in a ridiculous manner to speak against it. Dr. *Morison*, I say, as the effect of so much Labour, did first receive the fore-mentioned Hints from the above-nam'd *Gesner*, *Columna* and *Cæsalpinus*; and by distributing of the Plants, not only according to these Hints, but according to his own repeated Observations, *reviv'd*, *restor'd*, and I may justly say *founded*, that which is called *Method*. And because he justly assumes the Glory of so great a Work to himself, he is revil'd, despis'd, call'd proud, vainglorious, ostentatious^h, &c. and even by those who were much more profited by him, than he was by *Gesner* and *Columna*, so of-

^h Verùm cùm sibi nimis placeret & alios se doctiores contemneret, majora viribus aggredi & plantarum historiam universalem conscribere ausus, nec famæ suæ consuluit nec aliorum expectationi satisfecit. Præf. ad Hist.

ten thrown in his Face, and so much made use of as a Handle against his Memory; but any impartial Person, who will but take notice of his own Words, and read him in his own Language, will, I'm persuaded, be ready to have a quite different Impression from what is industriously spread against him.

In the Dedication of the *Hortus Blesensis*, to King *Charles II.* he says, “ⁱ That the
“ Method is now given by Nature, and by
“ him alone (without Vanity) only observ'd,
“ discovered by none but himself, although
“ it be of an equal Date with the begin-
“ ning of the World.” This is the Expression which makes all the Noise; and yet if it be look'd to by an impartial Eye, it is not so liable to Exception as others would have it: For let it be own'd, that he built upon the Foundation of others, yet by his correcting of their Errors, clearing up of their Obscurities, and making the whole so plain and obvious, by considerable, not imaginary Alterations, *ex autopsia*, from the exact Observation of the *Plants* themselves; and if the several Distributions of the *Plants*, according to the Foundation, be his own, without the Help and Assistance of any other, may not he justly have call'd all this his own do-

ⁱ Quin & methodum meam novam à natura datam à me solummodo (citra jactantiam) observatam à nullo nisi me ipso in hunc usque detectam quamvis mundi incunabilis sit coæva. Hort. Bles. Epist. Dedicat. ad Car. Reg. 2.

ings; and is there any just Reason of reflecting against him for so saying? But hear him farther, as to what he proposes for a Recompence to his Pains; and how propheticall he has prov'd in what he propos'd; "I persuade
 " my self, says he, that your Island of *Britain* (speaking to King *Charles*) shall here-
 " after have as good reason to glory in the
 " Knowledge of Plants by a most exact *Method*, which is that of Nature it self, as the
 " *Germans, French* and *Italians*, were famous for their Knowledge of the *Botany*
 " without a *Method* in the former Age^k.
 And what a vast Progress the Knowledge of *Botany* has since made in the Island of *Britain*, by the Means of *Method*, to which he gave the first Example, very well appears at this Day.

The second Part of the Calumny rais'd against him was promoted by a Foreigner^l, viz. that in his *Hallucinationes* he had reflected upon the Authority of so great an Author as *Caspar Bauhinus*; as if Error should still be allow'd to continue, and not be spoke against, because of the great Value and

* Polliceor Britanniam vestram cum methodo exactissimâ quæ est naturæ ipsius imposterum in re Botanicâ gloriari posse; quemadmodum Italia, Gallia, Germania, superiori seculo in scientia Botanica sine methodo gloriati sunt.

^l Nullam itaque video querelæ causam quam Konigius de Regno vegetabili, p. 34. adducit contra Morisonum; quod in Hallucinationibus suis auctoritatem tanti viri Bauhini elevarit. Charact. Plant. Genuin. Ammanni. p. 13.

Esteem of those who first advanc'd it. But see what he himself says upon that Subject; "I would not have you, friendly Reader, says he, to look upon me as a vainglorious and insolent Writer, because I do not only correct the Errors of those of this Age, but the chief of all the *Botanists* that ever liv'd; I mean the celebrated Brethren *John* and *Caspar Baubinnus*. By the frequent Inspection, and by a long and continued Examination of their Volumes, I find them to have been Persons of great Judgment, indefatigable Pains, and incomparable Knowledge in the *Botany*; and I do declare, that, whether by Fate or a natural Propensity, they had a great Desire to promote and encourage all the Students in that Science; but that both have frequently err'd, any Person, who has but a moderate Knowledge in the *Botany*, will soon observe, by the reading of this small Treatise: Nevertheless, I confess that to err is a human Failing. I am a Man my self, nothing is to be expected from me but what is human. I doubt not but I have also err'd (*hallucinatus*) in these small Treatises; therefore I desire to be forgiven by thee for these my *Hallucinationes* or Errors^m." This, one would think, is modest

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^m Noli quæso amice lector me gloriosum aut insolentem existimare Scriptorem, quod non solum hujus sæculi sed omnium
nium

deft and condefcending enough, attributing due Praifes to his Predeceffors, without affuming too much Glory to himfelf: Yet *Nebelius*, the Annotator upon *Ammannus*, will not let him go fo, but being preposfeff'd with what others had advanc'd to his Prejudice, puts a finifter Conſtruction upon this, contrary to what he defires; and alluding to this Paſſage, he infifts, “ The Difficulty and Extenſivenefs
 “ of the Study of *Botany*, may eaſily excuſe
 “ the raſh and unpremeditated Errors of that
 “ moſt deſerving *Botaniſt*, *Caspar Bauhinus*,
 “ according to *Moriſon*’s own Acknowledg-
 “ ment, (*Loco Citato*,) in naming and diſtri-
 “ buting of the Vegetables; which whether
 “ *Moriſon* himſelf committed the like, when
 “ he too confidently and boldly did dare to
 “ aſſert, that the Method of diſtinguiſhing
 “ the Plants by the Fructification, was only
 “ diſcovered by himſelf, when he does not
 “ mention, among the Authors cited for wit-
 “ neſs, *Cæſalpinus* and *Columna*, who former-

nium qui adhuc extitere, Botanicorum coryphæos duos Caſparum & Joannem Bauhinum fratres corrigo. Ex frequenti enim ipſorum voluminum inſpectione & ex longa & diutina eorundem examinatione ipſos ſummi judicii, indefeſſi laboris & incomparabilis doctrinæ in ſcientia Botanica homines fuiſſe obſervo; ipſosque ſeu fato ſeu naturali propenſione maximum in promovendis ſtudiis Botanicorum habuiſſe deſiderium: pariter declaro errâſſe multoties utrumque; nemo in Re Botanica mediocriter verſatus inficias ibit. Hos meos tractatulos legendo labi nihilominus humanum eſſe confiteor; homo ſum ipſe, humani à me nihil alienum puto; in hiſce meis tractatulis hallucinatum me eſſe non dubito. Quapropter hallucinationes meas ab amico lectore notari deſidero. Præf. ad Halluc. Bauhin.

“ ly

ly commended and design'd this Method, I leave it to the Judgment of others". The *Matchiavillian* Principle here holds good, *Calumniare audacter & semper aliquid adharebit*. I would ask that Writer, whether commending and designing a Method be putting it in practice, by distributing of Plants according to it? But his being prejudic'd against Dr. *Morison* by the Instigation of others farther appears; for after he had ascrib'd to him that due Praise which none yet had the boldness to refuse, he says, "That he could not escape the just Censure of *John Ray* and *Pitton Tournesort*, for publishing the Thoughts of others as his own Invention, and never known to any before.

It is these and the like Expressions, us'd by Foreigners, that oblige me to insist longer upon the Character of Dr. *Morison*, and to search the Ground of all this Prejudice to the Bottom: But before I do that, I shall produce several Testimonies of more impartial Authors, and even of those piqu'd against him,

ⁿ Studii Botanici difficultas & amplitudo excusare facile potest Caspari Bauhini viri in re Botanica (ipso Morisone in præfat. hallucin. teste) optime meriti improvisos in denominandis digerendisque vegetabilibus errores; quales an etiam Morison commiserit dum suam plantas à fructificatione dignoscere methodum à se solo detectam neminique prius cognitam audacter nimis asserit & tamen inter auctores ad testimonium citatos suis, Cæsalpini atque Columnæ qui eandem methodum pridem commendarunt & designarunt, mentionem fecit, aliis dijudicandum relinquo. Nebel. Annot. in Amman. p. 13, 31.

thereby to shew the Value of that great Man; and to shew how far he is to be look'd upon as the Author and Founder of Method. I shall begin with the fore-cited *Ammannus*.

“ In the mean time, says he, by very good
 “ Fortune did the Town of *Aberdeen* in *Scot-*
 “ *land* bring forth *Robert Morison*, by whose
 “ Favour and inexpressible Diligence, the *Bo-*
 “ *tany* of the Ancients is recovered, and has
 “ now put on a quite different Countenance,
 “ as may be seen by any unbiafs'd Person,
 “ who is not blinded with Prejudice in the
 “ *Hallucinationes*, which he so abundantly
 “ produc'd against the *Methods* of the Anci-
 “ ents, in his *Hortus Blesensis*, and *Historia*
 “ *Oxonienfis*; insomuch, that (without pre-
 “ judice to our Ancestors) I am not asham'd
 “ to say, there appears more Candour,
 “ more Truth, in these his nervous Works;
 “ and that there is contain'd in them, more
 “ to the Benefit and Advantage of the Pro-
 “ fessors, than in the most numerous Volumes
 “ of ancient Writings; and being oblig'd to
 “ declare it out of Conscience, rather than
 “ from any Love and Affection I may have
 “ to the several Parts of that Study, I doubt
 “ not but this Affair might have been brought
 “ to the utmost Pitch of Perfection, by the
 “ Publication of the other XXIV *Sections*,
 “ which would have compleated the whole
 “ *History of Oxford*, had it not pleas'd Al-
 “ mighty

“ mighty God to have dispos’d of that
 “ great *Botanist* otherwise”. The same in-
 genious Author says further P, “ That *Cæ-*
 “ *salpinus Castellus*, and *Fabius Columna*
 “ had thought upon this Method, as appears
 “ by what is here and there scatter’d among
 “ their Writings; but I know not what Stops

◦ Interea Aberdunum in Scotia felici admodum omine protulit *Robertum Morisonum*, cujus auspiciis atque ineffabili solertia Botanica veterum delarvata atque aliam longe faciem nunc induit, veluti videri est cuilibet præconceptis opinionibus non obcæcato ex Hallucinationibus quas in horto Blesensi & historia Oxoniensi, luculenter, adduxit contra methodum antiquorum; adeo ut citra tamen injuriam antecessorum dicere non erubescamus, in nervosis hisce operibus plus nitoris plus veritatis atque plus commodi ad philiatros spectantis contineri, quàm in numerosissimis voluminibus omnium quæ sapit veterum profapiam. Conscientia cujusvis extra partium studia atque affectus positi, sit arbitra. Nec dubitandum quin ad supremum perfectionis apicem negotium hoc fuisset deductum editione restantium viginti quatuor sectionum quibus historia Oxoniensis tota compleri debebat, nisi deo cujus erat γέωργιον de hoc insigni Botanico aliter visum fuisset. Amman. Præfat. ad Charact. Plant.

P Meditatos hoc fuisse ingeniosissimos Cæsalpinum Castellum & Fab. Columnam hinc inde ex scriptis illorum liquet. & nescio quid moræ interea interjectum fuerit quo minus hucusque negotium istud potuerit perfici. instet aliquis, alii præter hos munere istoc functi sunt peculiare, methodum Botanicam adornandi. Audio hæc sed non memini me ullum autorem legere qui attendisset legem naturæ, id est quæ genera & species plantarum per notas essentielles, quæ semper & omni insunt, sumendo differentias à fine ultimo sciz. à fructificatione; non inqua memini ullius: Citra tamen supercilium & arrogantiam utpote qui per multos annos hoc unice egi solus. At ipse *Morisonus* glaciem hanc fregit hyperboream in Hallucinationibus quas contra Bauhinos tam in histor. Oxoniensi quam hort. Bles. publici juris fecit. Amman. Charact. p. 3.—

“ and Delays interven’d, which all along
 “ hinder’d that Affair from being brought to
 “ Perfection; let any Person produce ano-
 “ ther (beside these) who did that Work, who
 “ by a peculiar *Method* had adorn’d the *Bo-*
 “ *tany*. I have heard of these Things, but
 “ do not remember that I have read of any
 “ *Author* who has so observ’d the *Method*
 “ of *Nature*, that is, which distributes the
 “ *Genera* and *Species* of *Plants* by the *es-*
 “ *sential Notes*, which are in every one ta-
 “ king their Distinction from the *Ultimate*
 “ *End*, which is the *Fructification*. I do
 “ not remember, says he, any who with-
 “ out Vanity or Arrogancy has done so as I
 “ have done for many Years. But it was
 “ *Morison* himself who broke this tough Ice
 “ in his *Hallucinationes* against the two
 “ *Bauhini*’s, both in his *Hortus Blesensis*,
 “ and *Historia Oxoniensis*”. But his Anno-
 tator will not let it go so, he tells you,
 “ That *Conradus Gesnerus* had thought of
 “ that Method 130 Years agoe, &c. when
 “ he wrote to his Friends, that the Nature
 “ and Kindred of the Plants was to be taken
 “ from the Fruit, or rather Flower and Seed,
 “ than from their Leaves^q.”

That this was *Gesner*’s Opinion, is own’d by the consent of several Authors, as also by

^q Hisque priorem C. Gesnerum qui ante plus centum & triginta annos in suis epistolis ad amicos scripsit ex fructu femine ac flore potius quam folio, stirpium naturas & cognationes apparere. Nebel. Annot. in Amman. p. 4.

some Fragments of his Epistles yet extant; but then this Opinion was only scattered here and there, as *Ammannus* says of *Cæsalpinus*, without any Improvement made of it, or any *Method* brought to Perfection by it: Nor was it so long before *Cæsalpinus* and *Columna*'s Time, for *Gesner* was Cotemporary with them. He wrote his Epistles, *Anno* 1564, and dy'd in 1565. *Cæsalpinus* 1562, and *Columna* much about the same time; for his Works were posthumous, being publish'd after his Death by *Hieronymus Columna* 1592, and afterwards 1606, by all which it appears, that the three wrote much about the same Time; and if *Gesner* did any thing upon that Subject, most of them perish'd by the Carelessness of *Wolphi*'s and *Camerarius*, as the ingenious *Tournefort* testifies; so that whatever any of them advanc'd upon that Head, whatever *Nebelius* or his Abettors, or rather Instructors, could say to the contrary, the bringing of Method to any degree of Perfection, is intirely owing to the great Dr. *Morison*, which will further appear by the Testimonies of other unbiass'd Foreigners, and even from the Writings of such as have express'd so much Enmity against him.

Dr. *Knaut*, in his *Methodus Plantarum Genuina*, testifies thus: " But when the celebrated *Morison*, observed that all these *Methods* were carry'd on by mere Accidents, that they were instable and falli-

“ ble, and as the Philosophers say, no ways
 “ Scientifick, therefore he neglected, and
 “ threw them off, substituting, or rather
 “ restoring more *essential Characters* or *Dis-*
 “ *tinctive Notes* of *Plants*, which cannot
 “ deceive^r; and again, having shew’d how
 “ uneasy it was for *Caspar Bauhinus* to un-
 “ derstand *Cesalpinus* his *Method*: So much
 “ the more Praise is due, says he, to the *Ce-*
 “ *lebrated Morison*, who having overcome
 “ the Difficulties that stood in his way, re-
 “ covered his praise-worthy *Method*, and re-
 “ stor’d it from Darkness to Light”, accor-
 “ ding to that notable Character given him by
 the *Celebrated Dr. Tournefort*^f.

“ The true Method of constituting the
 “ *Genera* of *Plants*, may be attributed to
 “ *Gesner* and *Columna*; but it’s probable
 “ that had yet lain in Darkness, had not
 “ *Robert Morison*, a *Scotch* Man, of *Aber-*
 “ *deen*, who was for several Years Overseer
 “ of the Gardens belonging to that High and
 “ Mighty Prince, *Gaston*, Duke of *Orle-*
 “ *ans*, renew’d, restor’d, and first of all ac-

^r Cùm enim Clarus Morisonus in *prælud. Botan. hist. Ox-*
on. & sect. de umbellif. animadverteret per mea accidentia
 procedere omnes istas methodos, instabiles adeo ac fallaces
 necquod philosophi aiunt scientificas; neglectis iis resectisque,
 essentielles potius characteres seu notas plantarum distincti-
 vas, à fructificatione fallere nesciâ desumptas, substituit aut
 verius restituit. Knaut. *Dissert. Prælim. de Meth. Plant.* p. 3.

^f Tanto majori laudi datur *Cl. Morisono*, quod superatis
 quæ obstare videbantur difficultatibus methodum laudatam,
 velut è tenebris in lucem retraxit. *Ibid.* p. 5.

“ commodated

“ commodated it for daily Use, for which
 “ he’s highly to be prais’d, and he would
 “ have yet deserv’d much more, if he had not
 “ been too much puff’d up”. Thanks be to
 Mr. *Ray* for this last part of the Character,
 ’tis from his Insinuations that all these bad
 Impressions have proceeded, as is too evident,
 notwithstanding which he is forc’d to ac-
 knowledge his other Perfections in *Botanick*
 Matters.

“ So long as he (*Robert Morison a Scotch*
 “ Man, of *Aberdeen*) kept himself within
 “ his own Bounds, or mov’d within his
 “ own Sphere, by composing the Catalogues
 “ of Gardens, finding out the *Characteri-*
 “ *stick Notes* of the *Genera*, discovering and
 “ correcting the Errors, or as he is pleas’d
 “ to call them, *Hallucinations* of *Botanists*
 “ in the Disposition of the Species, he de-
 “ serv’d very much to be prais’d; but when
 “ he became too full of himself” — I wish
 Mr. *Ray* had let this last part of Dr. *Morison’s*

“ Legitima igitur constituendorum Generum ratio Gesne-
 ro & Columnæ tribui debet, eaque forte in tenebris adhuc
 jaceret nisi *Robertus Morisonus, Scotus Aberdonensis*, qui per
 plures annos præfuit Hortis serenissimi principis Gastonis,
 Aurelianensium ducis, eam quasi ab herbariis abalienatam re-
 novasset, instaurasset, & primus ad usus quotidianos adjunxisset:
 qua in re summis laudibus excipiendus, longe vero majoribus
 si à suis abstinuisset.

“ Hic quamdiu intra limites suos se continuit & catalo-
 gis Hortorum componendis notis Generum caracteristicis in-
 dagandis Botanicorum, in dispositione specierum, erroribus aut
 ut loqui amat, *Hallucinationibus* detegendis, corrigendisque
 operam dedit. laudem sane meruit. Verum cum &c. *Raii Hist.*

Character,

Character, already cited*, alone, for *Turpe est Doctori, cum Culpa redarguat ipsum*. There is not one Word in all that second Part, but a malevolent Pen might apply, so as to make it retort upon Mr. Ray himself. So true it is, that *Carere debet vitio qui in alterum paratus est dicere*. But I forbear, least I should be said to reflect as much upon Mr. Ray, as he has done against Dr. Morison; and shall only add what Account I have receiv'd from those who were intimately acquainted with Dr. Morison, viz. That he was a plain, down-right, honest Man; no Flatterer nor Dissembler, but who would tell the naked Truth upon all Occasions, *Fuit vir qui ficum ficum vocavit*, says the Author of his Life. As he loved Botany himself, so he was a sincere, hearty Lover and Encourager of Botanists; his Fame was so far establish'd before he came to England, that he had no reason to be afraid that Mr. Ray's Appearance would darken his Light; but the Truth is, he had already establish'd a Method, such as he was of Opinion was sufficient for the Improvement of Botany. The Opportunities he had of observing Plants enabled him and render'd him still the more capable to correct what he might have done amiss in his first Volume, and alter the Dispositions as he had a mind, in what he was to publish in the other Volumes; so that he had Reason to be angry with any other, who

* P. 78. Litera h.

not having the same Opportunities of becoming *Botanists*, would attempt to establish any other Method than he had done. Mr. *Ray* on the other hand, had by this Time acquir'd a moderate Skill in *Botany*, and had he apply'd himself to, and kept a Correspondence with Dr. *Morison*, who was in such a Station as it was no disparagement for him to do so, then they might have compar'd their Thoughts, and communicated to each other what they found convenient for the Advancement of that Science, by one and the same Method, without endeavouring to multiply *Methods*, so as to confound the Learners; but when instead of that Mr. *Ray* would needs set up for a Method of his own, in Opposition to the other, Dr. *Morison*, or any other in his Station, had reason enough to be angry with him for it; for Mr. *Ray* labour'd under so many Inconveniencies when he compos'd it; the many Errors with which it abounded when compos'd, and the Assistance he had from Dr. *Morison's* Writings, (all which Mr. *Ray* acknowledges fully himself) were such as I am afraid will render Mr. *Ray* the ostentatious and vain-glorious Person, and shew how fond he was to be Dr. *Morison's* Rival, and how little capable he was of being it. So that as Dr. *Morison* had reason to be angry with Mr. *Ray*, it was a great Failing in Mr. *Ray* to have such a Relentment against Dr. *Morison's* Memory, since 'twas Mr. *Ray* who first gave the ground of Offence. But

But leaving this, and to shew how impartial I am, I shall produce several Instances to prove, that Dr. *Morison's Method* in his Second Volume, is not so perfect, but that it needs several Amendments, which had he liv'd, perhaps he had corrected himself; for as none in his Time understood better how to make Observations upon *Plants* than he did, so the Escapes in his *Method* seem to have proceeded purely from Inadvertency, and not from Ignorance.

* Dr. *Knaut* very justly remarks, " That
 " he is not every where consistent, nor ob-
 " serves the *Method* he had propos'd with
 " the same Constancy; but whereas he ought
 " always to have taken the Notes of the *Sub-*
 " *altern Genera*, from the *Fructification*
 " only, sometimes he takes them from the
 " *Leaf*, sometimes from the *Stalk*, from the
 " *Climbers*, *Capreoli*, and *Roots*; but for
 " these he is rather to be blam'd for Incon-
 " stancy than for any inexplicable Obscurity".
 This is a just Character of his *Method*, and
 in this he is excusable so far, in that when he
 compos'd it, he was to do all of himself; not
 one of his Contemporaries so much as dream'd
 of *Method* before he did it; he had none to

* Hoc uno forte culpandus (*Morisonus*) quod iisdem
 methodi vestigiis non ubique pari constantiâ insistit, sed quas
 à fructificatione petere undequaque debebat generis subal-
 terni notas, à foliis alicubi caulibus item capreolis, atque
 radicibus desumserit; inconstantiae potius quam obscuritatis
 inexplicabilis coarguendus. *Knaut. Meth. Plan. genuin. p. 4.*

correspond or consult with concerning it; in the which he laboured under far greater Inconveniencies, than any who have writ upon Method since, who had nothing to do but observe his Steps, and correct his Escapes rather than Errors, in order to make up a compleat Method; for I find he fail'd chiefly in making of his *Sections* too large; so that after he has done with what more particularly belong'd to such a *Section*, there are some Incoherencies in several Chapters of the *Subaltern Genera*, v. g. In the *Sect. de Umbellif.* which was the Specimen of all the rest, and therefore first published. After he has done with those, by the common Consent of all reckoned *Umbelliferous Plants*, he subjoins the *Umbelliferae improprie dictae*, such as *Valeriana*, *Valerianella*, *Valeriana Græca*, by Tournefort call'd *Polemonium*, *Pimpinella Sanguisorba*, *Thalictrum*, *Filipendula*, *Ulmaria*; none of which can be class'd with the *Umbelliferae*, except by some Resemblance in the Disposition of the *Flower*, which is competent to other Plants beside them.

In the first *Section* he places *Christophoriana* next *Asparagus*, because its Berries are *Racematim dispositae*, Chap. 2. the *Campanulatae Lactescentes*, such as *Convolvulus Scamonia dictus*, &c. betwixt the *Bacciferae* and *Pomiferae Scandentes*, though both of them have a *pulpous* and *parenchymatous*, and these *Campanulatae*

panulatae have a dry *membranaceous Fruit*; by which they should rather have been plac'd after them, or join'd with the other *Convolvuli*. *Convolvulus Heteroclitus sive Lupulus*, is *Heteroclitus* indeed in this Place; for there is nothing can bring it in here, unless it be an infirm Stalk, which requires a Pole to support it.

Sect. 2. The first fourteen Chapters of this *Section* are acknowledg'd to belong to the *Leguminous Plants* by all Authors; but then the *Trifol. Acetos.* in the 15. *Frag. Vesca* in the 16. the *Pentaphyllæ* and *Pentaphylloid* in the 17. and *Pentaphyllis Affines*, as *Alchymilli*, in the 18, ought to be disjoin'd, and plac'd elsewhere.

Sect. 3. *Tetrapetalæ Siliquosæ Bicaps.* are very regular for the first 10 Chapters; and the *Chelidonium majus* in the 11. may not be unfitly join'd with them, provided the *Glaucium* or *Papaver Corniculatum* be join'd with it; for they should always go together, notwithstanding that Dr. *Tournefort* will have the *Chelidonium* among the *Flores Cruciformes*, and the *Glaucium* among the *Flores Rosacei*, upon no other account than the Largeness of the *Petalæ* in the one, and Smallness in the other. *Fumaria* is not right plac'd betwixt the *Chelidonium* and *Raphanus*, *Lysimachia*, as being *Quadricapsular*, and the *Flower* being upon the top or the Pod may be plac'd elsewhere. *Papaver Capitatum* should

should not come in here, because its Head is not properly a *Siliqua* but a *Capsula*, no more than *Balsamina Fæmina*, because of the Fashion of the *Flower* and *Fruit*, which is *Unicapsular*, not *Multicapsular*. *Veronica* is but ill join'd with the *Tetrapetalæ Siliculosæ*, because it has a *Monopetalous Flower*; nor do I well know, whether its *Fruit* should not rather be call'd a *Capsula* than a *Silicula*, though it in some measure resembles that of the *Bursa Pastoris*: Nor has the *Polygala* much to do with this Place, either by *Flower* or *Fruit*.

Sect. 4. goes pretty regularly on with the *Monopetalous Flowers*, divided into 6 *Segments* or *Hexapetalous* ones; to all which succeed a *Tricapsular Fruit*, till it come to Chap. 25. at the second Distribution; and then I do not see how the *Anemone*, *Caryophyllata*, *Ranunculus*, and *Hepatica Nobilis* can come in.

Sect. 5. Has its *Title* from the Number of the *Capsulæ* and *Petala*. This, as much as any, wants to be more regularly dispos'd; for it seems the Doctor had heap'd them up without any special Regard, either to *Flower* or *Fruit*, v. g. If according to the *Fruit*, then the *Unicapsulares* should have begun, and the rest of course, according to the Number, as *Anagallis*, *Nummularia*, *Auricula Urfi*, *primula veris*, among the *Monopetalæ*. *Caryophyllus*, *Lychnis*, *Linum*, &c. among the *Pentapetalæ*. The *Bicapsulares Monopetalæ*

la might have follow'd, as *Digitalis*, *Scrophularia*, *Antirrhinum*, *Linaria*. Next to them should have been the *Tricapsulares*, *Monopet. Lactescentes*, as *Campanulae ejusque Species*, *Rapuntium*, and *Pentapetalæ*, *Hypericum*, &c. though, according to Mr. Ray, there are some of the *Hyperica* are *Quinquecapsulares*, *Asarum*, so called by Tournefort, or *Androsenum*, *Flore & Theca quinque-capsulari omnium maximis*, Moris. which is a Species of the *Hypericon*. But of these, and the like, I could give many more Examples, both in this second Volume publish'd by himself, and likewise in the third, publish'd by Mr. Bobart after his Death, to shew, that though he was the first who brought Method to any regular Footing, yet the short time he liv'd, and the want of Assistance for so great a Performance, are two very great Reasons why he did not bring *Method* to that Perfection he might have otherwise done: And as I have already told how he encreas'd the Number of his *Sections*, had he been more exact in the Manner of disposing his *Chapters*; and had he considered a little farther of the *Number* of the *Petala* in the Flowers, or look'd upon them to be of as great moment as they have been since he wrote, his *Method* had been better look'd upon, his Enviars had not had such an Opportunity to detract from his Fame; and Method it self had arriv'd at a far greater Perfection,

fection, had not his untimely Death prevented it; so true is the Proverb, *Better is a living Dog than a dead Lion*. How great a Length he had gone, in order to bring *Method* to Perfection, let any impartial Reader judge; when they consider, with what Accuracy he return'd every particular Species to its proper *Genus*, and how exact he was in the Description of them, at a time when scarce any knew how to give a tolerable Description of any particular *Plant*: So that the *Tetrastick* compos'd by the Celebrated Dr. *Pitcairn*, and subjoin'd to his Picture, will seem to be no *Hyperbole* to those who shall seriously peruse his Writings.

*Quæ, Morisone, viro potuit contingere major
Gloria, Pæonium quam superasse Genus?
Ipse tibi palmam Phæbus concedit Apollo,
Laureaque est Capiti quælibet Herba tuo.*

Mr. *Ray*, his Competitor, was the next who attempted any thing upon *Method*. He from his Infancy had a great *Genius*, not only for *Botany*, but for all the other Parts of the natural History: Beside that, he had a peculiar Faculty of excerpting from *Authors* what made for his Purpose, when he betook himself to any particular Science. This set him early in the Humour of writing. His first Essay was the *Catalogus Plantarum Circa Cantabrigiam*,
H where

where he tells, in the Preface, what Difficulties he surmounted, before he could arrive at any tolerable Degree of Knowledge in the *Botany*, for want of knowing *Botanists* to teach him, and having only Books to rely upon, whose Descriptions were often faulty; That after some time he began to consider to what Tribe or Family each Plant did belong: but as *Method* at that time was not understood, his Knowledge that way could not be very great. At length, he says, after six Years he began seriously to think of composing a Catalogue of Plants, which naturally grow near to *Cambridge*. He was three Years in perfecting this Work, and at last he publish'd it in *Anno 1660*^x. but did not think fit to fix his Name to it, until he should see how this his first Essay would take. The Catalogue, considering that neither the *Botany*, nor *Method* of distributing Plants were as yet well understood, is tolerably well done. It's the Effect of a good deal of Reading, and there are here and there not unfit Observations upon several of the *Plants*, chiefly concerning their *Virtues*, but few or none in rectifying of the Descriptions of the Plants given by Authors, or of their *Genera*; and they being Alphabetically dispos'd, he had no Difficulty in the Distribution. *Gerard*, *Park*. and the *Bauhini*, were they whose Names he generally made use of.

^x Præf. ad Catalog. Plant. Circa Cantabrig.

About seventeen Years after this, *i. e.* Anno 1677. having now travelled all over *England*, as himself informs us, and understanding that the *Cambridge Catalogue* was sold off, and that a new Edition was wanted, he enlarg'd the Bounds, and compos'd a Catalogue of all the *English* Indigenous Plants, entituled, *Catalogus Plantarum Angliæ & Insularum adjacentium*. In the Preface to this, he promises shortly to publish his *Nova Methodus*. And now he seems to be fitted for such an Undertaking; for *Morison's Præludium Botanicum* had been publish'd eight Year before, and no doubt such a diligent, inquisitive Person, as he was, would be sure to excerpt whatever was fit for his Purpose, as himself acknowledges. His Observations chiefly consist in enumerating the Virtues, for as yet he had not accusom'd himself to the making Observations upon the Plants themselves; and indeed that seems to have been much his Failing, throughout the whole Course of his *Botanick* Writings; that he trusted more to the Observations of others than to his own: Which thing expos'd him first, to the Censure of Dr. *Morison*, who thought it strange, that Mr. *Ray* should still retain the Names, continue to acquiesce in the Errors, and yet compeal with him, who made it his continual Business to detect the Errors of others, by proper Observations of his own. This it was which made Dr. *Morison* often say, that Mr.

Ray studied Plants more in his Closet than in Gardens and Fields; and this was the first Ground of Contention betwixt them: For Dr. *Morison* being a plain dealing Man, and one who would tell the Truth at all Hazards, did not fail to tell it upon all Occasions; especially since he understood that he was set to work in *Methodising* of Plants, when he scarce knew their *Characters* by ocular Inspection: And it was the Tartness of this severe, though true Reflection, which created such a Resentment in Mr. *Ray* against Dr. *Morison's* Memory, even after the Doctor's Death, that he never forgot it to his dying Hour, as is already declar'd. Nor was this Disesteem of him upon that account, only harbour'd by Dr. *Morison*, but by all Foreigners, who had occasion to see his Writings; This it was which gave occasion to Dr. *Tournefort* to reflect so much upon his want of proper Observations upon Plants in his *Elementes Botaniques*, as Mr. *Ray* himself takes notice ^y.

It was this which made his History so little valued abroad; and this made even his *Methodus Emendata* receive so little Encouragement here in *England*, that he was forc'd to send it to *Holland*, and make use of the Interest of Dr. *Hotton's* Influence, before he could get it published there.

^y Verum dum paginas negligentius revolve, me sæpius nominatum totiesque fere notatum ac reprehensum invenio. Raii Epist. ad. Rivinum. Postc. p. 52.

Indeed if we consider the Inconveniencies Mr. *Ray* laboured under, when he set to work about his *Nova Methodus*², it may be look'd upon as a Piece of the greatest Boldness to attempt it; and it is very much that he got it perform'd, faulty as it is: But, as is said, he was oblig'd to Dr. *Morison's Præludia* and *Hallucinationes* for it, which he himself does not deny^a; and therefore though he assum'd the Title of it to himself, yet the Foundation is Dr. *Morison's*. This *Nova Methodus* being published anno 1682, he immediately after that compos'd his General History in two Volumes, which he publish'd four Years after. This is chiefly taken from *J. Baubinus*, his Brother *Caspar*, *Clusius*, &c. as also from Dr. *Morison's non Descripts* in his *Prælidium Botanicum*, and but a very few Observations of his own. So that these Volumes owe no more to him than the Pains of Collecting, and the *Method of Distribution*, which is altered a little from the *Nova Methodus*, but not purg'd of its Imperfections, as is by him-

² Cùm species plantarum hætenus cognitæ nondum viderim, nec dum describerim; cùmque rure degam Londinio aut Oxonio procul nec Hortus Botanicus in propinquo esset quem nondum satis exploratas inspecturus adeam nec mihi ad plantas conquiendas, coemendas otium aut facultates supeditant.

^a Nec reticere debeo me è D. *Roberti Morison* M. D. & Botanices professoris Oxoniensis præludii Botanici & historia plant. universal. mutuatum esse quæ ad rem nostram facere videbantur. Raii Præf. ad Nov. Method.

self own'd in his *Methodus Emendata*^b; and what is the Opinion those abroad have of it, is to be seen in *Rivini*, his Epistle to him^c.

The next Treatise he publish'd was his *Sylloge Stirpium extra Britannias Nascentium*, which is compos'd of several Catalogues of Plants, either observ'd by himself in his Travels, or excerpted from Authors. His Genius seems to have been much bent towards the writing of Catalogues, and finding out the *Locus Natalis*, which is of no small use to those who travel to those Parts mentioned by him; and it had been no small Advantage to the *Botany*, if he had understood *Method*, at the time he observ'd where the Plants grew, so far as to give the Characters of the Plants, when he had so many good Opportunities of seeing them. In the Preface to that Volume there are are two things remarkable.

1. He takes notice of the Male and Female Flowers in the Plants, and goes into Dr. *Grew*'s Sentiments, concerning the Manner of *Fæcundation* of the Seed; which I suppose he has taken from what Dr. *Grew* advanc'd upon the Subject: But of this more hereafter.

^b Quod Methodum illam qua in historia plantarum stirpibus disponendis usus sum, suis etiam defectibus & vitiis laboraretur, ipse animadvertit, tum ab aliis admonitus sum. Præf. ad Meth. Emend.

^c Verum de methodo, Deo vitam prorogante viresque & valetudinem largiente, in posterum promittis, (Præf. ad Syllogen. p. 19.) utinam id factum fuisset ante historiam plantarum editam. Sat cito attamen si sat bene. Rivini Epist. ad Johannem Ravium. p. 13.

2. He takes notice of *Rivini's* Method, which gave ground to the *Dissertatory* Epistles betwixt *Rivini* and him; as also to the *Dissertatio de Variis Methodis*, where he takes *Tournefort's* Method to task.

His *Catalogus Plantarum Angliæ* being well receiv'd, and he by this time having arriv'd at a competent Degree of Knowledge in *Method*, undertook the disposing of the *British* Plants (formerly receiv'd alphabetically) into his *Method*, under the Title of *Synopsis Stirpium Britannicarum*.

Dr. Morison being dead, and the Science of *Botany*, by his Influence first, and now by *Mr. Ray's* Industry, having put on a quite different Face, and begun to flourish more in *Britain*, by the indefatigable Endeavours of a great many knowing and ingenious Persons: And *Mr. Ray* having begun of a long time to write, all the *British Botanists*, as one Man, entertain a Correspondence with him, and communicate to him whatever they found worthy of Observation. So that if *Mr. Ray* began to write with great Disadvantages, no Man had better Opportunities to write afterwards to good Purpose than he had; nor to become a most famous and celebrated *Botanist*; nor was there any Science which made greater Advances in this learned Age than the *Botany* did, during the Life of *Mr. Ray*. By *Dr. Morison's* Death, *Mr. Ray* had no Competitor. *Botanists* abroad had not thought

of any other *Method* than Dr. *Morison's* till Mr. *Ray's* appear'd: And Mr. *Ray* being now more fully inform'd of the Indigenous Plants, his *Method* also being now brought to a greater Perfection, he disposes of them according to it. This is a notable Performance, and most deserving of the Name of one, who had now acquir'd so great Fame. In this he has the Civility every where to acknowledge his Benefactors; neither does he keep up from any what is due to them, except Dr. *Morison*, whose Distribution he often uses, without ascribing his Name to them; as can be made appear from several Instances: I shall only name one. In the former Catalogues he followed *C. Baubinus*, in the Distribution of some of the *Alfine's* and *Anagallis aquat.* but now he makes them all *Veronica's*, being taught so to do by *Morison's Præludium Botanicum* and *History*, and yet points out this Distribution as his own. For an Example see the following Note*. For as all *Botanists* have

* *Alfine* fol. Tussag. Raii Cat. Cant. Cat. Plant. Angl.

Veronica Floribus Singularibus in oblongis Pediculis Charmædrifolia Raii Syn. Stirp. Brit. p. 178. Moris. Halluc. 392.

Alfine fol. Veronic. Ibid.

Veronica Flosc. Singularibus Cauliculis adhærentibus. Ib.

Alfine Hederacea. Ibid.

Veronica Flosculis Singularibus Hederulæ fol. Ibid.

Anagallis aquat. Min. fol. Subrotund. Cat. Cant. p. 10. Cat.

Veronica aquat. Rotundif. beccabunga dicta minor. Synops.

have the Civility towards one another, to mention the Author, either of a new Distribution, new Genus, or new Name of a Plant, so Mr. *Ray* fail'd in this, that he gives *Morison's* Distribution of these Plants among the *Veronica's*, but does not mention *Morison's* Name; by which they who know nothing of it will be ready to take them for Mr. *Ray's* own Disposition; whereas had he affix'd the Name *Morif.* to them, he had done more for his own Credit than otherwise.

Mr. *Ray*, I say, is so just to his other Correspondents, that he mentions every one of them with that just Regard and Gratitude they truly deserve at his Hands. In that elaborate Treatise therefore, he every where acknowledges Mr. *Dale* his Fellow-labourer, Mr. *Dodsworth*, *Doody*, *Lawson*, *Lhuyd*, *Newton*, *Petiver*, Dr. *Plot*, *Pluyknel*, *Sloane*, *Sherard* and *Robinson*; nor is the ingenious Mr. *Jacob Bobart* to be forgot, whom with Mr. *Walter Moyle*, and Mr. *William Vernon*, he adds, as his Benefactors, in the Preface to his second Edition.

Cat. Plant. Angl. p. 19.	Synopl. Stirp. Brit. 178.
	Morif. Halluc. 393.
Anagall. aquat. Min. fol. oblong. Ibid.	Veronica aquat. Longifol. Media. Ibid. Min. fol. oblong. Morif. Ibid.
Anagall. aquat. Min. fol. Augustifol. fol. Ibid.	Veronica aquat. Augustif. Min. Raii. Ibid. Aquat Augustif. Morif. Ibid.
Chamædris Sylvestr. Spuria Cat. Cant. p. 32. Cat. Plant. Angl. p. 64.	Veronica Chamædris Sylv. dicta. Ibid.

This

This is a Set of such *Eminent Botanists*, as no Nation can produce the like Number to have flourish'd in any one Age at once, or within so small Bounds, most of which either have, or are about to publish elaborate Treatises of their own Composure upon that Subject; among whom the whole Society of *Botanists* throughout the World are big with the Expectation of that incomparable *Pinax*, as the Work of so many Years indefatigable Endeavours, the Product of so numerous and unparallel'd a Collection of Specimens, and the effect of so vast a Correspondence which that eminent *Botanist*, Dr. *William Sherard*, whom *Dillenius* and many others, call *Botanicorum Anglorum decus singulare*^d, or as *Volkhamer* says, that he is *Botanicus Anglicus sine pari inque Naturalium Historiâ versatissimus*, has kept for many Years, every where, whither the ordinary Course of Commerce, his extraordinary Fame for his Skilfulness in *Botany*, or his own Personal Presence could lead him; so that if great Assiduity, and indefatigable Pains in searching after the Plants themselves, and the collecting of *fair Specimens* in most of the Habitable Parts throughout all *Europe* and *Asia*, visiting the most curious *Gardens* every where, and obtaining from thence whatever was rare and curious, which the most eminent *Botanists*, where-

^d Præf. ad. Nov. Gen. Plant.

ever he went, had the greatest Fondness to afford him. I say, if all these, together with his own Accuracy in observing the Plants or Specimens, and most intimate Knowledge how to dispose them into a *Method*, can render a Work compleat that may be expected of Dr. *Sherard* his *Pinax*, which 'tis hop'd will, e'er long, see the Light, if a continual Supply of new Specimens and Non-Descripts do not retard it, by still affording new Work, in disposing each of them according to their true *Genera* and *Species*, by which we may expect That *Method*, (which is at present the occasion of great Disputes) may receive the finishing Stroak.

Mr. *Ray* being thus furnish'd with Correspondents at Home, and the Assistance of those eminent *Botanick* Authors abroad, who having learn'd how to dispose *Plants* into a *Method*, from those of *Britain*, and in their Turn had begun to cultivate *Botany*, and frame new *Methods*, thought it convenient to publish a Supplement to his History, and correct his former Method; Therefore, having collected from *Herman*, *Rivini*, *Tournefort*, *Volkhammer*, *Plumier*, *Commelli*, *Commelin*, *Hortus Malabaricus*, and others mention'd in the Preface, he from them, together with what Materials his *British* Friends afforded him, compos'd a Third Volume of History, as big as any of the two former; among these, that accurate and expert *Botanist*

nist, and most diligent and curious Natural Historian, Sir. *Hans Sloane*, Baronet, and M. D. gave no small Assistance, whose extream Knowledge of the *Plants* very well appears, by his *Catalogue of Jamaica Plants*, from that great Number of *Non-descripts*, whereof he communicated the Manuscript Description to Mr. *Ray*, and which make up no small part of his *Supplement*, and from his *Natural History of Jamaica*, whose diligent Search and Enquiry after all Kinds of *natural Productions*, and whose immense Collection of the *Specimens* of all Kinds of *Plants*, which with his rich Cabinet of *Medals*, choice Library of *Books*, and other remarkable Pieces of Art, serve to make up one of the most valuable *Musæums*, or Chamber of Rarities, that is this Day to be seen any where, especially in the Hands of any private Person: To which Mr. *Petiver's* Collection of *Rarities*, dry'd *Specimens* of *Plants*, and *Books*, has of late made no small Addition. That late curious and most indefatigable, celebrated Author, by his singular Knowledge in all the Parts of the *natural History*, particularly of *Plants*, by his great Industry and unwearied Diligence in traversing most Parts of *England* and *Holland*, by keeping Correspondence with most of the *noted* and *ingenious natural Historians* every where; by his daily receiving of new Supplies of *natural Productions* from all Parts of the World, made up

up a most curious Collection of Rarities; and by his *Museum, Gazaphylacium Artis & Naturæ; Collection of Amboina-Shells, and American Ferns*; also by the *Prints* of his *British Herbal*; and last of all, by his *Hortus Siccus*, which makes up so good a part of this *Supplement* of Mr. Ray, (all which are now in the Custody of Sir Hans Sloane) acquir'd immortal Fame during his Life, and has left a perpetual Memorial of his Labour, Industry and Pains behind him, by the fore-mention'd Writings and Prints, which are now dispers'd every where.

But that which has render'd Mr. Ray's *Supplement* the more compleat, is the considerable Help afforded him by Dr. Sherard, who not only enrich'd it, by the Addition of a great many *Non-descripts*, but also by his Goodness and Civility towards him, in comparing and correcting his Manuscripts, and fitting them for the Press, when himself, through Weakness and old Age, had not Strength to perform it.

And now I am come to his long look'd for, and much wanted *Methodus Emendata & Aucta*. Dr. Morison's *Method*, by his untimely Death, never was compleated, for it still wants the first Part, which is that of the *Trees and Shrubs*. His own *Nova Methodus*, by the great Advancements *Botany* had made every where, was found erroneous; those abroad were now fam'd for *Method*, when

when it was almost worn out in *Britain*, where it first began : Therefore Mr. *Ray* found it convenient to correct what he had formerly writ upon that Subject, and to enrich it with new Observations and Characters of *Plants*, from *Herman*, *Rivini*, and *Tournefort*, and from what his *British* Correspondence communicated to him ; among whom was that ingenious and most expert *Botanist*, Dr. *Charles Prestone*, Intendent of the *Physick-Garden* at *Edinburgh* ; so that it is now render'd a most compleat Work, and one of the best Performances upon that Design. But the Science of *Botany* is so very extensive, and to write upon *Method* depends so much upon the particular Observations made upon the *Plants* themselves, that upon further Examination, this *Method* of Mr. *Ray* is not yet purg'd from all its Defects, which since *Dillenius*, of whom hereafter, has undertaken to correct and supply, I shall leave it to him and proceed to give a short Account of the *Method* it self.

He divides the *Plants*, first into the *Plantæ non Floriferae*, and *Floriferae*. I love this Distinction much better than his former, which is still us'd in his *Supplement*, viz. into *Plantæ Imperfectæ* and *Perfectæ*, though both proceed from the same Reason, because there are a great many *Plants*, which at first View, without the help of Magnifying-glasses, appear to have neither *Flower* nor *Seed* ;
but

but that all *Plants* have both, is now plainly made appear, from the curious Observations of some late, modern, nice Observers of *Plants*, particularly of Mr. Geoffroy in the Vegetation of the *Trufles* or *Tubera Terræ*, and ^e Mr. Reaumur upon the *Flower* and *Seed* of several *Fucus's*; ^f and other *Marine Plants*, ^g and several others, notwithstanding what *Dillenius* may alledge to the contrary, as has been observ'd. Under the Head of the *Non-floriferæ*, are comprehended the *Fuci*, *Fungi*, *Musci*, *Submarinæ* and *Capillares*.

Mr. Ray divides the *Floriferous Plants* into *Dicotylidones* and *Monocotylidones*; the *Dicotylidones* are they whose *Seed* sends forth two *Seed Leaves* when it springs, and the *Monocotylidones* only push forth one.

The *Dicotylidones* are *Herbæ Flore Stamineæ*; these in his *History* and *Supplement* are class'd among the *Plantæ Imperfectæ*, because the *Flowers* have no *Petala*, but only *Stamina* and a *Calix*: Then he goes on with the *Lactescentes* and *Pappescentes*, *Corymbiferæ* and *Capitatæ*, of all which we have given some Hints already.

From them he proceeds to the *Flore Perfecto Simplici*, *Semine nudo Solitario*, as *Valeriana*, &c. the *Umbelliferæ* or *Gymno Di-*

^e Memoir del Academie Royal de Sciences pour L'an 1711. p. 29. ^f P. 371. ^g Pour L'an. 1712. p. 28. Edit. Amsterdam.

spermæ, whereof somewhat already; the *Stellatæ*, *Asperifoliæ*, and *Verticillatæ*. The *Notes* of all these three, are chiefly taken from the Disposition of the *Leaf*.

Then he goes on to consider them in their Fructification, as *Semine Nudo Polyspermæ*; *Herbæ Pomiferæ*, *Bacciferæ*, *Multisiliquæ*, *Vasculiferæ*, and flavoring *Flore Monopetalo*, *Dipetalo*, *Tetrapetalæ Siliquosæ*, and *Leguminosæ*.

The *Monocotylidones*, are *Gramini-foliæ Floriferæ*, *Vasculo Tricapsulari*, *Bulbosis Affines*, of which already, *Grimini-foliæ Culmiferæ*, as the *Frumenta* and *Gramina*; and last of all, the *Anomalæ*, or *Incertæ Sedis*.

The *Trees* are divided into the *Flore à Fructu remoto*, as the *Coniferæ*, non *Coniferæ*; *Quercus*; *Piluliferæ*, *Platanus Lanigeræ seu Papposæ*, *Populus Salix*, and *Bacciferæ*, as *Myrtus*, *Juniperus*, *Taxus*, *Morus*.

The *Arbores fructu contiguo*, are *Pomiferæ* and *Bacciferæ*, *Umbilicatæ*, *Pruniferæ seu Testaceæ*, or Stone-Fruit; *Pomiferæ* and *Bacciferæ non Umbilicatæ* as *Malus Aurantia*, &c. among the *Apples*; and *Viscum* among the *Berries*.

They are in the third Place, divided into *Fructu Sicco*, as *Acer*, *Fraxinus*, and *Siliquoso non Papyronaceo*, as *Sena*, *Cassia*, &c. *Papyronaceo*, as *Anagyris*, *Collutea*, &c.

Thus

Thus I have briefly given an Account of all the *Botanick* Writings and *Method* of Mr. *Ray*, of whom to give an impartial Character, I cannot do it more truly than in his own Words, when speaking of *Johannes Baubinus*, viz. “That he was a Man of great
“ Learning, a faithful Friend, of infinite Reading; of a ripe Judgment, and thoroughly
“ acquainted in all the Writings of the modern and ancient Botanists, and most conversant in all kind of human Literature”; particularly the *Natural History*, in which he made a vast Proficiency, as well in the Animal and Mineral, as in the Vegetable Kingdoms; He laboured under great Disadvantages at the beginning of his Studies, but that was afterwards sufficiently recompens’d, by the vast Number of Correspondents he had towards the latter end of his Days; and happy had it been for *Botany*, had he been at Pains to examine the *Plants* themselves before he began his *Method*, and continued to make his proper Observations upon them, before he publish’d any other of his *Botanick* Works; His Writings would not have needed so many Corrections, Amendments, and new Editions:

i Vir Eximiæ eruditionis, summæ fidei, infinitæ Læctionis, maturi judicii, in omnibus Botanicorum, tam antiquorum quàm recentiorum scriptis versatissimus, omni humanioris & severioris literaturæ versatissimus. Raii Cat. Plant. Circa Cantabrig. Explic. nom. Auth.

Nor would he have been so much expos'd to the Obloquy and Reproach of others during his own Life.

In a word, He was a great and good Man, and did not behave unworthy of himself in any thing, so much as in that cruel Resentment he always had against Dr. *Morison's* Memory; in which perhaps it may be thought I have insisted too long already; but all I design'd thereby, was to give an impartial Account of the ground of the Debate betwixt them.

As to his *Method*, I can give no better Account of it, than that of the celebrated Dr. *Tournefort*, who having reflected too much against him in his *Elementes Botaniques*, was advis'd to desist from so doing in his *Instituti-nes Rei Herbariæ*, by that ingenious and expert Botanist, Dr. *Charles Preston*, as himself intimates in his Letter to Mr. *Ray*, and therefore Dr. *Tournefort* says no more of him, but gives this just *Character of his Method*.

“ *John Ray*, Fellow of the *Royal-Society*
 “ of *London*, was one who left nothing of
 “ almost all the Parts of the *Natural History*
 “ untouch'd; he was not contented with ha-
 “ ving collected, illustrated, and digested into
 “ one Body, the best Things that are to be
 “ found in every one of the *Botanick Wri-*
 “ ters, and to have added several new *Plants*,
 “ but he also handsomely distinguish'd all the
 “ *Plants*

“ *Plants* already known, attributing to
“ every one their proper *Notes*^h.

I have now done with these two great, *British Botanick* Lights, who have favoured the World with such Discoveries and Improvements as have been since sufficient to exercise the Fancies of the curious *Botanists* every where Abroad, and as an *eminent Botanist* lately observ'd to me, that Dr. *Morison* is to be valu'd for his Discovery of *Method*, as Dr. *Harvey* for the *Circulation of the Blood*, though there are not wanting Malevolent Writers, who would deprive both of that just Honour and Praise that is due to them for so valuable Discoveries. But 'tis not they alone whom the envious *Foreigners* would deprive of their true Merit; in spite of which *Britain* still remains happy in a great many other valuable Discoveries and Improvements made within her Borders, which no other Nation can pretend to the like, let grinning Malice do her worst.

Paulus Ammannus was the first
after Mr. *Ray*, who attempted
any thing of *Method*; he pub-

Ammannus Method.

i Johanni Raio, socio Regio Londinensi, qui nullam ferme historię naturalis partem intactam reliquit. Non fuit satis quæcumque optima in singulis plantarum scriptoribus occurrunt in unum corpus coacervasse, digessisse, illustrasse, quam plurima nova addidisse; plantas etiam hucusque cognitās in sua genera pulchrè distinxit, singulorum proprias notas recensens. Tourn. *Isagog.* 53.

lish'd his *Character Plantarum Naturalis à fine Ultimo, viz. Fructificatione desumptus*. He treats of the *Plants* Alphabetically, and ascribes Dr. *Morison's* Notes to them, without any considerable Alterations. The Treatise is but short, and only design'd for a Pocket Volume. This he publish'd at *Leipsick, Anno 1685*. This small *Manual* is reprinted at *Frankfort, Anno 1701*. by Dr. *Nebelius*, who has enlarg'd it with Annotations, chiefly compos'd of Observations taken from other *Botanick* Authors since the first Publication.

Herman's Method.

The next is Dr. *Herman*, one of the most consummate *Botanists* of this last Age: He was Professor of *Botany* at *Leyden*, and travell'd assiduously in rectifying of Dr. *Morison's Method*; for as has been told, Dr. *Morison*, by his untimely Death, left his *Method* incompleat; Mr. *Ray* liv'd to support the Authority of his, but Dr. *Herman* not being pleas'd with it, as not being brought to that Perfection he wish'd for, preferr'd Dr. *Morison's* to it, as aiming at a more regular way in disposing of the *Plants* according to their *Fructification*, and has alter'd it in such a manner, that it ceas'd any more to be Dr. *Morison's*, but Dr. *Herman's*; as if one by repairing of an House, should so alter the several Apartments in it, that it may rather be call'd a new House, built upon the former Foundation. He

He begins with the Consideration of the Number, Disposition, and other Accidents belonging to the *Seeds*; therefore they are, according to him, either *Gymnopolyspermæ*. Here he justly places *Chelidonia Minus*, *Hepatica Nobilis*, along with the *Ranunculi*; as also *Adonis* and *Anemone Nemorosa*, and its *Congeners*; neither are the *Pentaphylla*, and *Pentaphylloides* unfitly brought to this Neighbourhood. Most of this Class are *Pentapetalæ* or *Polypetalæ*, but then he subjoins the *Malvaceous Class*, which is wrong, both upon Account of the *Monopetalous Flower*, and *Capsular Fruit*.

The next are the *Gymnodispermæ*, or *Umbelliferae*, because of the two *Seeds* succeeding to each *Flower*; and since he has so little regard to the *Flower*, he might have subjoin'd the Tribe of the *Rubia's*, *Aparine*, *Asperula*, &c. for they have *Bina semina post singulos Flores*, and are sometimes *Umbellatim disposita*, as in *Asperula*, and their having *Monopetalous quadripartite Flowers*; and *Stellate* or *Radiate Leaves* did not hinder their being brought into the Neighbourhood of the other, since they were to be led only by the Disposition and Number of the *Seed*.

3. *Angiomonospermæ*, when one *Seed* succeeds to each single *Flower*. *Valeriana* is justly separated here from the *Valerianella*, because of its having a *pappous Seed*. Mr. Ray

joins all the *Plants* of this Tribe together, under the Title of *Plantæ flore simplici semine nudo solitario post singulos Flores*^k; and I doubt if any of them will answer it; for each *Seed* of the *Valeriana*, as is rightly observ'd by *Knaut*, has a striated *Capsula*, in which each oval-pointed *Seed* is contain'd. *Valerianella* has a *Capsula* consisting of two Parts, yet generally having but one *Seed*, one part of the *Capsula* for the most part being empty, as is well observ'd by *Tournefort*, though *Rivini* would have two *Seeds* to succeed each *Flower*, by which it might be class'd among the *Umbelliferae*, according to Mr. *Ray*, but since that do's not always hold, and that *Characteristick Notes* are not to be taken from accidental Excursions, it may be very well plac'd among the *Monocarpi*, as all the others of this Class deserve to be. The *Mirabilis Peruviana*, now found out to be the *Jallapa*, seems to me to be a *Monocarpos*, for it can easily be strip'd of its outer Coat, when not dry'd up; and the *Capsulae* of all the *Monocarpi* are so even, the *Fruit* of the *Agriemonia* will not easily open when dry, tho' when it usually containstwo *Seeds*; neither will the *Seeds* of the *Malva*, some *Trefoils* and *Melilots*, nor *Fumaria*, easily quit their *Capsula*; though now, by the Consent of most *Authors*, all of them have a *Capsular Fruit*

^k Meth. emend. p. 44.

I think, as has been observ'd. *Circea* comes very well in, next to the *Agrimonia*, as to their *Fructification*, and therefore the *Flora Batava* might have spar'd a new Title, by making *Circea Angiospermos*, and *Agrimonia Angiospermis Affinis*, or *Monocarpos*, whereas its truly *Dicarpos*.

After this he goes on with Mr. Ray in the Enumeration of the *Pappescentes* & *Lactescentes*, *Pappescentes non Lactescentes*, *Capitatae sive Floribus Fistulosis*, *Planifoliae non Pappescentes* & *Lactescentes*, *Corymbiferae seu seminibus solidis*, but do's not distinguish betwixt the *Nudae* and *Radiatae*. *Ageratum sive Eupatorium Mesues*, by what I could yet observe, is a *Ptarmica*, and therefore is justly call'd by *Tournefort*, *Ptarmica Lutea Suaveolens*, of which I convinc'd Dr. *Prestone* long ago; and *Draco Herba*, or *Tarragon*, ought rather to be plac'd among the *Abrotana*, than betwixt *Artemisia* and *Tanacetum*. *Scabiosa* might go along with *Cyanus*, and therefore there is no need of a new Title; such as *Floribus Pluribus in Capitulum Congestis*. *Eryngium*, is justly plac'd by *Tournefort* among the *Umbelliferae*.

Next to these follow the *Stellatae*, *Asperifoliae*, and *Verticillatae*. I have observ'd, that the *Stellatae* ought to succeed the *Umbelliferae*. The *Asperifoliae* and *Verticillatae*, may very well follow each other, by the Reason of four *Seeds* succeeding to each

Flower, but then, according to the *Method* laid down, the Title should have been alter'd, and the *Stellatæ* should have been entituled, *Gymno dispermæ*, and the other two, *Gymno tetraspermæ*, with which *Lysimachia Gale-ricula*, or *Cassida* of *Columna*, and *Draco-cephalion* may be join'd, but not as *Affines*, being truly of the same Family by the *Fru-ctification*; from whence we may see the In-conveniency of *classing*, by the *Disposition* of the *Leaf*, for none of them are *Plantæ Verticillatæ*, and scarcely *Spicatæ*.

After them come the *Capsular Plants*, as *Unicapsularis*, but then here arises a great Confusion in respect of the *Flower*. *Primula Veris*, *Auricula Urfi*, are *Monopetalosæ*, and *tubulated*. *Alsine*, *Lychnis*, *Caryophyllus*, have *Polypetalous*, or *Pentape-talous Flowers*, with a *Tubulous Calix*. *Anagallis*, *Nummularia*, are *Monopetalous*, not *Tubulous*. To which may be added, *Portu-laca*, *Hydrophyllum*, *Glaux*; but *Trifolium Paludosum*, plac'd betwixt the two last, has a *Tubulous Flower*, so that to render this Tribe of the *Unicapsular Plants* more *regu-lar*, it had been convenient to have distin-guish'd them into *Monopetalous* and *Polypeta-lous Flowers*, and the *Monopetalous* again into those which have a *Tubulous Calix*, and which not.

2. *Bicapsulares*. Here arises another *Confusion*. *Centaurium Minus*, *Lysima-chia*,

chia Lutea, *Seda Bicornia*, seu *Saxifragæ Albæ Species*, *Blattaria*, *Verbascum*, *Gentiana*, *Digitalis*, *Gratiola*, are all *Monopetalous Flowers*, either divided into equal *Segments*, or having equal *Borders*; to which may be added, *Hyoscyamus*, *Nicotiana*, whereas *Acanthus*, *Antirrhinum*, *Linaria*, *Scrophularia*, *Pedicularis*, *Melampyrum*, *Euphrasia*, *Polygala*, are for the most part *Calcaris Donati*, or *Labiati*; the *Veronica* may be class'd in with the former, i. e. with the *Flowers*, which have more equal *Segments*. *Gentiana*, and *Centaurium Minus*, ought either to be join'd together, or immediately to follow each other, because of the Proximity of their *Characters*; *Facies externa Taste & Virtues*; all the *Saxifragæ's* are *Polypetalous*, except the *Aurea*, and therefore they ought to be dis-joyn'd. I suspect the *Lysimachia Lutea* has an *Unicapsular Fruit*, and therefore it ought to be inserted immediately before, or immediately after *Anagallis Lutea*, and *Nummularia*; for though they differ in the *Facies Externa*, yet with *Tournefort*, I do reckon them to be near of Kin to each other.

3. The *Tricapsulares*, though they should agree in the *Fructification*, as it is plain they do not, yet its no small Task to place their Subaltern *Genera* aright, so as to make them agree in the *Flower*, *Leaf*, and *Root*. *Hypericum* has a *Tricapsular Fruit*, but *Androsæmum*

drosemum Maximum Wheeleri, is *Pentacapsular*, though none will disjoin it from its *Congeners*, only *Tournefort* makes it immediately to follow them, by the Name of *Acyrum*. I suspect *Chamecistus* is *Unicapsular*, *Pyrola Quadricapsular*, *Gramen Parnassi* is *Unicapsular*; as also *Viola Indica*, or *Cardaminum*, has three *Capsulae* indeed, but they are *Disjunctae*, and as it were in *Capitulum Congestae*; neither is it *Seminibus Pluribus*, for every *Capsula* has but one *Seed*. *Asarum* has an *Apetalous Flower*, and is *Hexacapsular*; so that there is none which agree with the Title in this Class, except *Campanula* and *Convolvulus*, and these not always neither; for the Fruit of the *Campanula*, as *Tournefort* observes, is sometimes divided into *three*, and sometimes into more *Pouches*; and likewise the *Convolvulus* is sometimes *Unicapsular*, and sometimes *Tricapsular*.

The *Tricapsulares Tricoccae*, viz. the *Ricinus* and *Tithymals*, answer the Title well enough; but why the *Quadricapsulares*, &c. and the *Leguminosae*, should interpose betwixt these and the other *Tricapsular* Fruits, I do not understand: but since they make up a whole Class of Flowers, called *Flores Liliaei*, I shall examine them when I come to *Tournefort's Method*.

4. *Quadricapsulares*. I am sensible *Ruta* has sometimes a *Pentapetalous Flower*, but whether *Stramonium*, which has a *Monopetalous*

nopetalous Flower, does vary in the Number of the *Loculamenta*, I have not observ'd.

5. *Gerania* have indeed, for the most, a *Pentacapsular* and *Pentacoccous* Fruit; yet it's not the Number, but the Form of the *Capsulae Caudatae*, that make the *Genus* here. I think the *Ketmia* should have follow'd the *Malva's*, because of the same Flower; and that the Number of the *Capsulae* in the *Ketmia* is indefinite, and not always the same; neither is the Number always the same in the *Cistus* nor *Balsamina*, nor is it to be class'd with the *Trifolium Acetosum*, upon any other account than the Elasticity of the *Pod*; and at that rate, *Cucumer agrestis* might be join'd with it also, which is a quite different *Genus*.

Lastly, Among the *Multicapsular Plants* we shall own, that *Aristolochia* and *Nymphaea* is so, but neither can *Papaver*, *Argemone*, nor *Linum*, be join'd with any of these, for they are plainly *Unicapsular*, having several *Placentae* or *Lamellae*, which disjoin the *Seeds*, but which do not unite at the Center, so as to make up different *Loculamenta* or *Pouches*.

1. The next that follow are the *Plantae Siliquosae*. And first for the *Multisiliquae*. The *Seda*, *Cotylidon*, *Telephium*, *Paeonia*, *Helleborus*, *Caltha palustris*, and *Pseudo-Helleborus Niger*, *Flore Globoso*, or *Ranunculus Globosus*, may be all join'd together, because

because of the Figure of the *Flower*, but then *Aconitum*, *Aquilegia*, *Consolida Regalis*, should make up another *subaltern Genus*, because their *Flowers* differ from the former: To which may be added *Nigella*, because its *Fruit*, if not *Multisiliquous*, yet is *Multicap-sular*.

The *Siliquosæ*, *Unicapsulares*, *Bivalves*, which follow next, such as *Chelidonium majus*, *Papaver*, *Corniculatum*, as they are not *Papavers* because they are *Siliquosæ*, so they may be very well join'd with the *Tetrapetalæ* *Siliquosæ*, notwithstanding of the *Perianthium Bifolium Fugax*, *Raphanistrum*, *Hypecoon*, *Epimedium*, *Fumaria Sempervirens*, may be admitted here by the *Fructification*, though they differ very much by the *Flower*.

The *Siliquosæ Univalves*, such as *Gelsimum Indicum*, or *Bignonia* of *Tournefort*, and *Clematis daphnoides*, differ very much in the *Flower*; *Apocinum*, *Periploca*, and *Asclepias*, resemble each other, though the *Species* of the *Apocina* do not agree among themselves in the *Fructification*, except as to their being *Pappescent* as well as *Lactescent*.

The *Siliquosæ Quadrivalves*; as *Lysimachia Siliquosa* *Chamenerion dicta*, and *Corniculata*, differ from each other, because the one is *Pappescent*, and the other not.

The

The *Regular Tetrapetalæ Siliquosæ*, agree so well together by the common Consent of all Authors, that it is, as it were, difficult to class them amiss; and yet the *Raphanus Rusticanus*, is plac'd among the *Plantæ Siliquosæ*, whereas it should have been plac'd next to *Cochlearia*, for its plainly a *Planta Siliculosa*, though I shall not, with *Tournefort*, make it a *Cochlearia*, because they differ so much in the *Facies externa*.

The *Tetrapetalæ Siliculosæ*, differ so far in the Fashion of the *Pod* from each other, that their only Characteristick is rather in the Bigness than in the Figure. The hot pungent Taste peculiar to this Class of Plants, is a good enough distinctive Note, especially in such of them as are Water Plants, but there are some of the *Siliculosæ* that are not pungent, as in the *Bursa pastoris*, for that reason called *Thlaspi fatuum*, by Mr. Ray.

The next Tribe of the *Tetrapetalæ Siliquosæ*, called *Papylonaceæ*, or *Leguminosæ*, are easily distinguishable by their Taste, (called by Sir John Floyer, the *Pea Bloom Taste*) from all other kinds of Plants; so that its easy to class them together, though their distinctive Notes are not so very obvious; so that it is sometimes difficult to know which is a *Vicia*, an *Orobus*, &c. The *Lathyri* are easily discernible by the peculiar Figure of the Stalk; but there is no distinguishing the *Medica's* from the other *Trifoils* but by the Fruit, which

which is also the surest *Note* to know how to distinguish each particular Species of the same *Genus*.

I know not, as I said before, why these *Tricapsular* Plants which follow the *Leguminosæ*, were disjoin'd from those formerly treated of. *Tournefort* calls these here *Lilliaceous Flowers*. I shall leave all these class'd together by him, and consider the *Genera* which follow such, as *Cyclamen*, *Orchis*, *Helleborine*, *Orobanche* and *Ophris*; as all of them differ much in the Flower, so they cannot be class'd here by their *Tricapsular Fruit*, that being for the most part *Unicapsular*, and opening at the top by one, two or three *Holes*.

All the *Bacciferae* agree together, in so far as they bear *Berries*, but they differ so much otherwise, that they can never be regularly class'd together, v.g. *Rubus*, both in *Flower* and *Fruit*, differs from all the other, its *Flower* being *Polypetalous*, and its *Fruit* *Aggregate*, it comes nearer to the *Fragraria* than any, only that the one is *Herbaceous*, and the other *Fruticosus* or *Shrubby*: It would likewise resemble the *Morus* in the *Fruit*, if the *Morus* had not *Apetalous Flowers* distinct from the *Fruit*. *Smilax* and *Bryonia Alba*, are *Bacciferae Scandentes*, and near of Kin to the *Pomiferae Scandentes*, both in the Structure of the *Flower*, and Manner of the *Fructification*, and only differing from those in that Tribe by the Smallness of the *Flower*

Flower and Fruit. If any shall class *Christophoriana*, *Laurus Alexandrina*, *Lilium Convallium* and *Polygonatum* together, *per me licebit*; but methinks *Asparagus* comes but ill in betwixt these and the *Solana*; I should rather have chosen to have plac'd it first, because all the others have an undivided Leaf; or make it last of all, that all the *undivided Leaves* had been plac'd together, without the *intervention* of one whose *Leaf* is so deeply divided as the *Asparagus*; for though there be such a Disproportion among all these Plants, that they agree in nothing, save their being *Bacciferous*; so that its no matter which go before or which follow: Yet there are some kind of Decorum to be observ'd, even in the very placing of them; so that to place a *fine compound Leaf* amidst so many *simple ones*, would seem *incongruous*, unless by the Agreement of the other *Notes*, such as the *Flower*, &c. it were necessary to do so: v. g. Supposing all these *Bacciferæ* to be planted successively in a *Bed*, and *Lilium Convallium* on the one hand, and *Alkekengi* on the other of *Asparagus*, none could think they were class'd together on purpose, before they had occasion to observe the *Fruit*. The like Regard should be had to the *Facies* of all Plants, in the disposing them in a Garden, provided there be no Irregularity introduc'd in the *Characteristicks* by so doing.

The

The *Pomiferæ Scandentes*, such as *Cucumbers*, *Pompions* and *Melons*, are a very distinct Class. For the *Ficus Indica*, *Cereus* and *Ficoides*, it is not long since there were many Species of them here in *Europe*; but now that they have encreas'd to be a numerous Tribe, known by the general Name of *Succulent Plants*, they may be very well describ'd into several *Genera*, and dispos'd near to those with whom they agree in *Characters*, v. g. some to *Aloes*, some to *Seda*, some to *Tithymals*, some to *Asphodels*, and some have been plac'd along with the *Starwort* Plants; most of the *Ficoides* have some Resemblance to a *Radiate*, and sometimes to *Semiflosculous Flowers*. I wish the ingenious Mr. *Bradly* would continue in publishing the Figures of these *Succulent Plants*, as they are brought home, since they can be so lively express'd in Copper Plates, and since there is no Possibility of preserving dry Specimens of them.

The last Class is the *Herbæ Flore Stamineæ*, seu *apetalo*, *Pimpinella Sanguisorba*, *Plantago* and *Amaranthus*, are deservedly remov'd from among these by Dr. *Tournefort*. To these are added the *Herbæ Fuliferæ*, as *Calamús Aromaticus*, *Equisetum*. In *Clavem Dispositæ*, as *Typha*; *Aspergillum imitantes*, as *Sparganium*. After them do succeed the *Capillares*, or *Epiphylliospermæ*; and next to these the *Frumenta* and *Gramina*.

The

The Trees are class'd after the same manner with those of Mr. Ray, as the *Coniferae*, *Resiniferae* & *non Resiniferae*, *Nuciferae*, *Glandiferae*, *Bacciferae*, *Lanigeræ*, *Vasculis Foliaceis*, as *Ulmus*, *Acinis Coagmentatis*, as *Morus*.

The next Class is the *Pomiferae*, *Umbilicatæ*, *Polypyrenæ*, *Bacciferae Polypyrenæ*, as *Rosa*, *Grossularia*, *Vitis*, *Myrtus*, *Vitis Idæa*: But as all the other have *Succulent Berries*, I know not how the *Rosa* comes in here. *Dipyrenæ*, *Monopyrenæ*, *Pomiferae non Umbilicatæ*, *Polypyrenæ*, *Malus Aurant.* &c. *Pruniferae*, as *Malus Armeniaca*, *prunus Cerasus*, &c. Then follow the *Bacciferae Variæ*, as *Monopyrenæ*, &c. *Arbores Fructu Sicco*, *Monococco*, *Tricapsulari*, *Monospermo*, *Membranaceo Foliaceo Alato Seminibus Lanuginosis*; and last of all the *Arbores Siliquosæ*.

Thus I have briefly class'd the Trees, according to the Fructification in Mr. Ray and Herman, for Morison's Disposition of Trees was never published.

These are the Three, whose chief Design was to class the Plants by the Fructification, which though none of them have so closely adher'd to that Method as they might, yet they have set it on such a Footing, as with a very little Labour and Pains, by a few *mutatis mutandis*, it may be brought up to a good Perfection.

Dr. *Morison's* Business was to reduce the several Species into their proper *Genera*; and a great and laborious Work it was, considering how few Precedents he had before him. Mr. *Ray*, in his *Methodus Emendata*, has assign'd very handsome *Characteristicks* to each *Genus*: In which he had no small Assistance from *Rivini* and *Tournefort*; and he would have seem'd more *Methodical*, if he had not taken in too many Parts of the Plant to his Assistance; and Dr. *Herman's* first Design seems to have been to rectify Dr. *Morison's* *Method*, but he has done it so, as rather to make up a new *Method* than to correct an *old* one; it has a greater Regard to the *Fruit* than the other two, but it does not want its own Incoherencies and Inconsistencies, as has been shewn.

I consider in the next place
Rivini's Method. such Methods as class the Plants by the Flower, and usually distinguish them by the Fruit; *D. Augustus Quirini Rivini*, *Professor of Natural History at Leypsick*, is the first who thought upon this way of doing. He, observing that the Flower is the most *conspicuous Part* of the *Plant*, and as it always appears before the *Fruit*, so it is the first Token we receive, that such a *Plant* is of such a *Genus*; and being allur'd by their Beauty, was tempted to take their Figures and engrave them, where observing what correspondence

respondence there is betwixt the *Flowers* of the *same Tribe*, he doubted not, but by ranking them together, he could dispose of them into a very regular and orderly Method, and make their *Genus* be known before it could be discern'd by the Fruit. His Figures are elegant and fine, and the Specimens are drawn in their natural Bigness, by which if he should perfect the whole Method, it would be a large and expensive Undertaking. But as it is too much for a private Pocket to bear, and as there will be few to purchase Books of *Botany* of so large a Price, I'm afraid he will be oblig'd to give over his Design before it be half finished.

He classes the Flowers, 1. According to their *Figure*, in which respect they are either *Flore Regulari*, or *Irregulari*. 2. In respect of the Number of their *Petala*. Thus they are *Flore Monopetalo*, *Tetrapetalo*, *Pentapetalo*, and *Hexapetalo*, each in a separate Volume, whereof the first three are published, but the fourth has not come abroad yet, by what I can understand. As it is difficult to class so many Plants as there are now known under so few General Heads, so by this Method several Inconsistencies of separating must needs follow, such as the establishing of certain *Notes* for *Characteristick*, which are not always to be had in the same *Genus*, and perhaps not in the same Species. Some Species of the *Valeriana*, which is first of his *Mono-*

petalous Class of Irregular Flowers, have the Flowers divided into equal, and some into unequal Segments; and some of them are *Calcaridoti*, like the *Delphinium*, and some not: Shall either of these, which thus vary in the several Species, be accepted of as a *Characteristick Note*, to constitute the whole Genus? *Valerianella* also in several Plants of the same Species, has Flowers with some equal and some unequal Segments, for all which it is not to be separated from its Congener *Valeriana*: For as *Fungius*, *Ray*, and *Knaut*, (of whom hereafter) define a *Regular Flower* to be that, whose *Petala* or *Segments* do not so much agree in the Bigness, as in the Figure and Situation, so *Rivini*, in his *Introduct.* in *Rem Herb.* will have the other *Qualification* too, *viz.* that the *Petala* and *Segments* must also agree in the Bigness, that the *Stylus* be in the Center of the *Flower*, and that the Number of the *Stamina* be proportionable to the Divisions, or the Number of the *Petala*; as also that the *Calix* or *Perianthium* be *Regular*; so that it is most easy to determine concerning the *Irregularity* of *Flowers*, according to *Rivini's Definition*; insomuch, that if there be the least swerving from this Rule of determining of *Regular Flowers*, then it must needs be *irregular*: By which means he must needs expose himself to great Inconveniencies in determining of the *Flowers*, *v.g.* In what inextricable Difficulties does he involve himself,

self, about the *Gerania*, *Pyrola*, *Tithymals*, *Seda Bicornia*, *Malva*, *Alcæa* and *Lysimachia*, among the *Siliquosæ*; whereof some Species have a *Regular*, and others an *Irregular Flower*? And if the *Seda Bicornia*, as *Tournefort* has rightly distinguish'd them, are to be divided into *Saxifraga*, which is exactly *Regular*, and *Geum* whose Flowers are not always *Regular*, because they have sometimes an *Hiatus* on one side, and have not the *Stylus* in the middle; as also the *Petalæ* in the upper Part are bended outward, and in the lower they are bended inward, or are concave, by which they make an unequal Surface; so that these *subaltern Genera*, according to him, cannot be well join'd to the principal *Genera* of the same Class; the *Stylus* of the *Alcæa Vulgaris*, is not plac'd exactly in the middle, shall it therefore be separated from the *Malva*, of which every one knows it to be a *subaltern Genus*? Most of the *Europæan Gerania* have a *Regular Flower*; but the others, especially the *African Gerania*, have an *Irregular Flower*. This is observ'd by *Rivini* himself, and he seems to distinguish them by their *principal Genera*; therefore he calls the one *Geranium*, and the other *Gruinalis*. He reckons these *Gerania* which chiefly agree in the *Fruit*; for he says, the *Gerania* have *Semina Nuda*, but the *Gruinalis* has *Semina Vascularis inclusa*. I shall not dispute that with him, though it be the com-

mon Opinion, that all the *Gerania* have *Vascular* Seeds, *Geranium Cicutæ fol.* has almost *Regular Flowers*, has the *Semina Caudata*, and yet in *Rivini's* Sense, they are to be look'd upon as having *Irregular Flowers* and *Naked Seeds*. *Geranium Robertianum* has *Regular Flowers*, and not *Semina Caudata*, upon which account they are rather *Naked Seeds* than the other: So that it ought not to be a Species of *Gruinalis*, according to *Rivini's* Maxime. *Geranium Fol. Malvæ*, and *Columbinum*, seem in any respect to have *Regular Flowers*; and according to the Sentiments of *Ray*, *Herman* and *Tournefort*, they have the *Vascula Rostrata*, *Pentacocca*, so that they ought not to be separated from the other *Gerania*. The *Pyrolas* are join'd with the *Irregular Flowers*, and a *Vascular Fruit*, and yet by the excellent Figures he gives of them, they are all *Regular*, having nothing of *Irregularity* about them but the *Stylus*, which he compares to the *Proboscis*, though in some Species it is streight and short, as in the *Pyrola Arbutifol.* The *Tithymals* have their *Petala Regular*; and although the Weight of the *Tricoccous Fructûs Rudimentum*, which hangs about the middle of the *Stylus*, makes it to incline to one side, yet the part of the *Stylus* which is stretch'd forth without the middle of the Embryo, is regularly plac'd, being usually divided into three Parts in the Center. *Lysimachia, Siliquosa, Chamene-*

Chamenerion dicta Species, are by him among the *Irreglar Flowers*, though there be nothing of *Irregularity* about them, only that the *Long Stylus* hangs on one side, before its *Extremity* is spread forth into four *Segments*; but after that, generally speaking, it keeps the *Center*; and whether it be spread forth or not, it always arises from the middle of the *Pod*, being surrounded by the several *Stamina*, which forming an *Arch* in the bottom of the *Flower*, make up an empty Space for receiving the *Farina*, as we shall observe hereafter.

Lychnis Sylvestris, Quæ been *Album Vulgo*, has *Irregular Flowers*; and yet most of the *Flowers* of the other *Lychnis's* have their *Flowers Regular*. *Campanula Africana*, *Erini Facie Flore Violaceo*, *Cauliculis Procumbentibus*, *Herm.* has *Irregular Flowers*, and yet all the other *Campanula's* are *Regular*. And if we strictly observe *Rivini's Rules*, what can we certainly determine concerning the *Flowers*, *Ulmaria*, *Belladonna*, *Solanum*, *Nicotiana*, *Lysimachia*, *Salicaria* and *Erica*, kinds of *Opulus*. In the *Umbelliferous Class* some have *Regular Flowers*, and others *Irregular*, as in *Spondylium* and *Coriandrum*. The *Verticillate Kind* are for the most part *Irregular*, yet the *Flowers* of some *Species* of *Mentha*, and both the *Species* of the *Pulegium* (for which they are join'd to the *Mentha*) and *Lycopus* or *Marubium Palustre*, *Glabrum*, have their *Flow-*

ers Regular; infomuch, as *Tournefort* fays of them, fpeaking of the two *Lips*, *Sic tamen ambo fecantur ut flos quadripartitus primo aspectu videatur*: ^a And of *Lycopus* he fays, that it is *Flore Monopetalo sed labiato & quodammodo campaniformi; labium enim superius vix distingui potest à partibus inferioris, adeo ut primo aspectu flos quadripartitus videatur*. ^b That is, “It has a Lip, and
 “almost Bell-flower, for the upper Lip is
 “scarce to be distinguish’d from the lower; so
 “that at the first View it seems to be divided into four equal Parts.” And yet none will separate these two from their *Congeners*. And again, *Echium* has plainly an *Irregular Flower*, and yet none will justly separate it from its *Congeners*, *Borrago* and *Buglossum*, when they consider by its rough alternate *Leaves*, and all the *Facies externa* of this *Genus*, it can never be join’d to the *Verticillate* or *Lip-flower’d* Plants, notwithstanding it has four Seeds succeeding to each *Flower*, in common with the others of that Class; and if this Distinction of the *Regular* and *Irregular Flowers* be strictly observ’d, what shall become of the *Flores Corymbiferi Compositi Discoi-des* and *Semiflosculosi*, of *Tournefort*, where some of the *Flosculi* and *Semiflosculi* have the Borders divided into *equal Segments*, and others not? And where the *Capillamentum* of some is in the Center of the *Flower*, and

^a Tournef. Instit. p. 188.

^b Ibid. 190.

others not certainly, this would create a great Confusion, and make the several Species of the the same *Genus* to be separated from it upon every trivial Occasion.

The next part of this *Method* depends upon the *Number* of the *Petala*. If this be had any great regard to, what an Uncertainty would it introduce in several *Genera* of *Plants*, already determin'd by the common Consent of all *Authors*, v. g. In the *Papilionaceous Flowers*, they are generally look'd upon to be *Tetrapetalous*, consisting of two *Alæ*, or Wings, like those of a *Butter flye*. The *Vexillum* spread forth aloft, and the *Carina*, making up the lower part of the *Flower*, in Shape like the fore-part of a small *Boat*; for these *Flowers* are so small in some *Species*, as in the *Lagopus* and *Melilotus Minima*, that their *Number* can scarce be determin'd; and where the *Flower* is large enough, some of them are *Pentapetalous*, with the *Vexillum* divided into two other *Monopetalous*, as *Trifolium Vulgare* & *Montanum Purpureum*; and if the *Trifolium Pratense Album* be strictly examin'd, it will be found to be *Dipetalous*; nor has the *Number* of the *Petala* in the small flower'd *Medica's*, been yet determin'd: I suspect most of them will be found *Tripetalous*, and so in several small *papilionaceous Flowers*, as *Ornithopodium*, &c. Let any consider what *Tournefort* advances concerning these *Trifoils*, as also concerning the
Limonium

Limonium^a. He places it among the *Poly-petalous Class*, and among the *Flores Caryophyllæi*^b, and yet in the fore-cited Place, he says he found two *Species* of *Limonium*, with *Monopetalous Flowers*, viz. *Limonium Hispanicum frutescens portulacæ Marinæ fol.* and *Limonium Hispan. multifido fol.* but he did not think fit to separate them from their *Congeners*; and he is in the right, not to determine the Number of the *Petala* in the *Ranunculus*, *Pulsatilla*, *Clematis*, and the like. *Tormentilla* has for the most part four *Petala*, but I have often seen it vary into five; and shall it be separated from the *Pentaphyllous Class*, purely because of the Number of its *Petala*? The Number of the *Petala* in *Balsamina*, is uncertain, and some of the *Fumaria's* have *Bipetalous*, others *Tetrapetalous Flowers*. Many other Examples could be produc'd to prove the Instability of this *Method*, either in respect of the *Regularity* of the *Flower*, or Number of the *Petala*; but I shall leave them at present, since I shall have occasion hereafter to speak of this Subject, when I come to *Tournefort's* and *Knaut's Methods*.

The next *Method*, which in
 Volkhamer's Me-
 thod.
 order of Time was publish'd,
 was *Volkhamer's*, in his *Flora*

^a Isagog. in Rem Herb. p. 62. ^b P. 342.

Nuremburgensis. He's a learned and modest Author, and what he advances is with great Judgment; he has not made any *Methodical* Disposition of the *Plants*, but treats of them *Alphabetically*; upon his entring into any new *Genus* in the *Catalogue*, he gives the *Characteristicks* of *Morison*, *Ammannus*, *Ray*, *Herman*, and *Rivini*, in so far as his *Method* was then publish'd. He at last gives his own *Generical* and *Specific* Notes, when he begins with the *Seed*, after that the *Seed-Vessel*; from thence he considers the *Flower*, and then goes on with the *Stalk*, *Leaf*, and other less essential Parts of the *external Habit* of the *Plant*. He seems more inclin'd to class the *Plants* according to the *Fructification*, than the *Flower*, and is a very strict Examiner of the *Seed*, which he rather inclines to make the *Characteristick Note*, than the *Seed-Vessel* or *Fruit*; and although, as I said, he do's not dispose the *Plants* into any *Method* himself, yet by what Account he gives of the *Seeds*, *Seed-Vessels*, and *Flowers*, he has trode out a very good Path for such as have a mind to *methodise Plants* after him.

The noted and celebrated
Dr. *Pitton Tournesort*, Fel-
low of the *Royal Academy of*
Sciences, and *Botanick Professor* of the *Roy-*
al Garden at Paris, is the next, who accor-
ding to the Series of Years, undertook to esta-
blish a new *Method*. He was one who had an
early

Tournesort's Me-
thod.

early *Genius* for the Knowledge of the *Vegetables*, and when his Parents design'd him for other Studies, nothing could withdraw him from enquiring after the *Plants*: His great *Affiduity*, and serious Application towards the Science of *Botany*, soon advanc'd him beyond the reach of the ordinary Set of Herborifers, nor was it long e'er his Fame reach'd the Ears of the *French Court*; and happy was it for that *delightful Science*, that Monsieur *Fagon*, one of the chief Physicians to the *French King*, had such a Taste of *Botany*, as to be capable to judge of, and to encourage such as had made any considerable Advancements therein. This made him seek after *Tournefort*, when *Tournefort* scarce had Time to seek after him, and to raise him to the *Highest Pitch* of Preferment the *Cultivators* of that Science are capable of: How great is the Advantage which the *Liberal Arts* and *Sciences* reap, when they who are deservedly distinguish'd for their Knowledge in them, are encouraged, and receive suitable Rewards from Princes, Potentates, and other great Men upon the Earth? And how much do these fade, languish, and decay, when the Cultivators and Improvers of them, instead of being encouraged, are undervalued and set at nought every where? Nor did Dr. *Tournefort* prove unworthy of so great a Station; he with the utmost Earnestness prosecuted those considerable Discoveries and Improvements he formerly had

had made in the ocular Inspection of the *Plants*, by which he added a great many particular Observations to those of other *Botanick Authors*. The first thing he publish'd, or was publish'd in his Name, was the *Schola Botanica*, and being oblig'd to read *Botanick Lectures* in the Royal Garden, during the *Summer-Season*, he began to rank or class them according to the Similitude and *Affinity* of the *Flowers*, they being the first and chief conspicuous Parts of the *Plants*; and thus, by placing and displacing them from one Season to another, he at length thought he had brought them to a suitable Conformity: Upon which, after making Application to his Patron Dr. *Fagon*, he was encourag'd to take the Figures of the *Flowers* he had observ'd, and to dispose of them as he thought fit; nor did his Curiosity stop at the *Flowers* alone, he also takes notice of the proper *Fruit*, *Seed* and *Seed-Vessel*, belonging or succeeding to each particular *Flower*; and thus compos'd his *Elementes Botaniques*, where if he had not been earnest to dispose of the *Plants* after so singular a manner; and had he us'd greater Endeavours to conform himself to the Dispositions of others in several Cases, he had done more for the Advantage of *Botany*, than by following his own Scheme so closely as he did; for there are several Inconsistencies in his *Method*, not only in his imaginary Classes, and unheard of Figures of the *Flow-*
ers,

ers, but also in the Disposition of them, by making those which have no Resemblance succeed to each other; and it had consisted more with his Reputation, if he had made some Alterations, of which he could not but be sensible they were necessary when he publish'd his *Institutiones Rei Herbariæ*; but the Plates were engraven, they could not be alter'd without undoing most of what he formerly had done, and the *Method* was already established, which he knew not well how to change, without bringing the Students of his *Elementes Botaniques* into Confusion; therefore he was oblig'd to let it go on as it was begun, and let his Successors do with it what they had a mind. The fourth *Botanick Treatise* he wrote, was his *Histoire des Plants aux environ de Paris*, in which he has shewn a great deal of clear and judicious Knowledge of *Plants*. His Criticisms are true and just: The Mistakes of ancient Authors in the Figures and Descriptions, are modestly and impartially corrected. His own Descriptions of the *Plants*, when he gives any, are clean, neat, and distinct, nor can there be any thing done with greater Exactness. The Virtues of the Medicinal *Plants* are consonant to long and known Experience; and as to the *Analysis*, he every where gives that upon the Authority of the other Members of the *Royal Academy*, who it seems have registred all the Chymical Experiments made upon the *Plants*.
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His Corollary is the effect of the three Years Voyage he made to the *Levant*, at the *French* King's Charges, where he has added 1100 different, new, formerly unknown Species, and constituted several new *Genera*. These are all the Writings publish'd by that great Man during his Life, besides those most valuable Volumes of his Voyages, which have been published since his Death, and which 'tis probable might have come abroad with far greater Advantages had he liv'd to perfect them.

Tournefort, as is usual by all those who establish any new *Method* in their *Præludia, Præcognoscenda, &c.* begins with an *Isagoge*, wherein he enumerates the several *Botanick Authors*, and shews the *Origine* and *Progress* of that *Science* throughout all Ages. Then he proceeds to explain the several Parts of the *Plants*; after which he goes on in laying down the several Rules whereby to constitute a *Method*.

He says, that all the Parts of a *Plant* are not to be admitted, in order to an exact Distribution of the *Plants* into a *Method*; but a certain Number, which cannot amount to five; such as the *Root, Leaves, Stalks, Flowers* and *Seed*. For so many together would rather tend to the Destruction, than better Establishment of any certain *Genus*; therefore the Generical Parts of a *Plant* are only to be pick'd out among some of them, four is too many; for then 'tis to be suspected that an
Affinity

Affinity would rather be wanting than found, both in the *Species* hitherto known, and those to be found out. Neither are the Generical Notes to be taken from one part of the *Plant*, such as the *Leaves*, for then there would arise a great Confusion among those which have simple *Leaves*, v. g. whether they be smooth or rough; how they are plac'd, whether upon the whole *Stalk*, or at the bottom; whether alternately, or by Pairs, and what a Disorder would *Plants* be brought into, if all these which have a divided *Leaf* were join'd together.

Nor 2, is the *Characteristick* to be taken from the *Flower* alone, for then would the *Cucumbers*, *Melons*, *Pompions*, be join'd with the *Campanula's*, and *Convolvulus*, &c. which would be far out of the Road. Neither 3, can the *Seed* do it, for then would all the *Verticillate Plants*, viz. *Mentha*, *Melissa*, *Marrubium*, &c. make up but one *Genus*, &c.

Having therefore considered each single part of the *Plant*, he is of Opinion it must require two or three at most of these Parts to be join'd together by different ways for setting aside the *Stalk*. The *Roots* may be join'd either with the *Leaves*, or the *Flowers* with the *Fruit*. The *Leaves* may be join'd with the *Flowers* or with the *Fruit*; and lastly, the *Flowers* may be join'd with the *Fruit*, for the Conjunction of the *Root* with the *Leaves*,
and

and without any other part, can be of no use; nor can the *Root*, either with the *Flower* or with the *Fruit*, and therefore the true *Method* of constituting the *Genera*, must be by the *Flower* and *Fruit* together: He therefore lays down these three general Positions.

1. That there should be an exact *Method* in the Denomination of *Plants*, lest there be as great an Abundance of Names of *Plants*, as there are of the *Plants* themselves, which must needs happen, if every one take the Freedom to impose a new Name upon every *Plant*.

2. That all the *Plants* having the same *Facies Externa*, are not to be reckoned as belonging to the same *Class*, v. g. The *Herba Trinitatis Fuchsis*, is a *Viola*, though it have not the *Leaves* of a *Viola*. A *Mallow* can never be a *Betony*, though there be some *Mallows* with *Betony Leaves*. How many *Plants* are there which come from *Africa* with the *Leaves* of *Malva*, *Alchymilla*, *Myrrhis*, *Coriandrum*, which when they push out the *Flower*, and begin to frame the *Fruit*, shew themselves to be *Gerania*.

3. We should be oblig'd to impose new Names upon *Plants*, different from what our Predecessors had given them, if there were only regard had to the *Root* and *Stalk* for constituting the *Genera*. Thus the *Ranunculi Aconiti*, *Plantaginis*, *Graminis Fol.* &c. would be no more *Ranunculi*, if no regard is to be had to the *Flower* and *Fruit*.

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Therefore the following Rules are observ'd by him, not as perpetual, because some Allowance must be given to Use, and the several Opinions of *Botanists*; but such as he, is not inclin'd to depart from but very seldom, and that for very weighty Reasons.

1. That the *Plants*, which have neither a conspicuous *Flower* or *Fruit*, are to be distributed according to their other principal Parts, as well as if they had both.

2. A particular Regard is to be had to both *Flower* and *Fruit*, in the Distribution of such *Plants* as have them, since both Nature and Custom directs us to them.

3. We must adhere to the *Flower* and *Fruit* together, since they are fully sufficient to constitute the *Genera*.

4. Not only all the other Parts of the *Plants*, but also whatever else belongs to them, such as *Taste*, *Smell*, *manner of growing*, may be call'd in for Assistance, when the *Flower* and *Fruit* are not able rightly to distinguish the true *Genera*.

5. In order to throw out what may be superfluous, Enquiry is to be made whether such a *Genus* would be chang'd by so doing; for as nothing should be added to the *Flower* and *Fruit*, unless the *Genus* cannot be distinguish'd otherwise, so other Parts may be admitted if Occasion require it, v.g. *Populus* differs only from the *Salix* by the *Facies Externa*, and *Fœniculum* from its *Congeners*, by
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the fine Division of the *Leaves*, and *Helianthemum* from *Telephium*, by the *Leaves* arising in Pairs from the Joints of the *Stalk*.

6. The *Etymology* of the Names of *Plants* is not to be regarded, v. g. *Chamædrys* is so call'd from the Resemblance they thought one *Species* of it had to the *Oak*, for the Word imports a dwarf *Oak*, from χαμαι & δρῦς, as if it should be call'd *Quercus Humilis*; but this do's not hinder the *Scordium*, and *Scordio Affinis*, or *Salvia Sylvestris* to be a *Species* of it, for this last *Plant* cannot be a *Salvia*, because it has not the same *Flower* and *Fruit*; neither would it at this rate be a *Chamædrys*, because it has not an *Oak Leaf*.

Tournefort is averse from admitting of the *Summa Genera*, and *Subaltern* ones; but I am not of his Opinion; for the disposing of *Plants* so, is a great Assistance to make a clear Distinction of them in some Cases, v. g. *Malva*, *Malva Arborea*, *Althæa*, *Alcæa*, are all of the *Malvaceous Kind*, and yet no Person will say they are the very same *Genus*; but if *Malva* be admitted to be the *Summum Genus*, then *Althæa*, *Alcæa*, &c. may very well be accepted of as *Subaltern Genera*. If *Pentaphyllum* be receiv'd as a *Summum Genus*, then *Tormentilla*, *Argentina*, *Pentaphyllum Palustre*, are *Subaltern Genera*; for none of these can be called *Species* of the *Pentaphyllum*. If *Ranunculus* be a *Summum Genus*, how many *Subaltern Genera* belong to

it? *Anemone*, *Chelidonium Minus*, *Hepatica Nobilis*, because of its relation to the *Chelidonium*; all these in the *Flower* and *Fruit*, are *Ranunculi*, and yet they are *Subaltern Genera*, most of them having several *Species* belonging to them. How many *Subaltern Genera* do there belong to the *Geranium*, as *Batrachoides*, *Columbinum*, *Robertianum*, and several others, all which have their separate *Species*? However, this Liberty is not to be abus'd, for there may be an Error, in multiplying either the *Genera* or the *Species*, as well as in making too few of them.

The Science of *Botany* is so very extensive, *Plants* may be so variously distributed, *Non-descripts* which are daily brought from Abroad, are so numerous, and their *Characters* are so often different from the *European Genera*, that there is enough to do with all the Divisions, and *Sub-divisions* which can be invented, in order to bring them into a regular *Disposition*, and therefore that *Quadruple Distinction* of *Tournefort's* into *Class*, *Section*, *Genera*, and *Species*, seems to be one of its greatest Advantages, and preferable to that of *Genus primum, secundum, &c.* and after them the *Subaltern Genera*. For according to *Tournefort's Method*, *Malva* becomes the *Section* of a *Class*. *Althæa*, *Alcæa*, &c. are several *Genera* of this *Section*, yet still there is need for another Division, viz. The four first *Genera* are, *Flore* & *Fructu Malvæ*, and they are distinguish-
able

able by the *Calix*, or *Perianthium*, as shall be shewn hereafter; but there are four more *Genera*, which though they agree in the *Flower* with the *Malva*, yet they differ in the *Fruit*. Now if these cannot be rightly distributed for want of proper *Subdivisions*, when they are already branch'd out into four, how much more are *Subdivisions* necessary, when they are only divided into *Genera*, where the Number infers no Dependence upon one another?

To *Class* a *Plant* then, is to fix upon one particular part of the *Plant*, by which all kind of Vegetables, where such a part is to be had, is to be denominated, v. g. If the *Flower* is the part pitch'd upon, by which the *Plants* are to be class'd, then all the *Classes* throughout the whole *Method*, are to be denominated by the several *Flowers*. If the *Fruit* be the *Character*, then all the *Classes* are to receive their *General Title* from the *Fruit*, and so of the *Seed*, &c. This to me seems the readiest way to avoid the Confusion of *classing* by several other Parts of the *Plant* in the same *Method*. I shall not determine whether the *classing* by the *Flower*, or by the *Fruit*, be most consistent with the *Leges Naturæ*; but the *classing* by one part of a *Plant*, rather than by many, seems to be the more Uniform of the two, if the *Nature* of the thing will bear it.

Our *Author*, *Tournefort*, prefers the *Flower* to the *Fruit*, or any other part of the *Plant*, and his Reasons for it are, That as his *Method* has the Advantage of all others, by being simple, it can immediately lead one to the Knowledge of the Name of a *Plant*, for having found the *Class*, the Knowledge of the *Genus* is soon found out, and that being known, the Description of a *Species*, formerly unknown, will be easily learnt, and a *Non descript* can easily be reduc'd to its proper *Genus*: This is the shortest way to arrive at the Knowledge of *Plants*——But if there be a regard had sometimes to the *Leaves*, *Flowers*, *Stalks*, and *Roots*, whereto shall he who is ignorant of any *Plant*, have his Recourse? It is plain therefore, that the *Classes* of *Plants* ought only to have one *Foundation*, and That, ought to be one of the Parts by which the *Genera* of all the *Plants* are to be constituted, in the which the *Flower* ought to be prefer'd to the *Fruit*; for at the Examination of the Structure of the *Flower*, one may immediately, or within a few Days, come to the perfect Knowledge of the *Fruit*; yea, by the transverse cutting of the *Pistillum* or *Calix*, the Nature of the *Fruits* is easily known to those who are exercis'd in that way of doing; after which the Character of the whole *Genus* may be found out in a more succinct manner——But if the *Fruit* be requisite for constituting a *Class*, the next Season another

ther must be waited for, before the other part of the *Character* of the *Genus*, to wit, the *Flower* (which after the *Fruit* is ripe, withered and dry'd up) can be found out.

Therefore, in the constituting of a *Class*, the *Flower* alone must be us'd as the *Key* and *Foundation* of *Botany*, in such *Plants* as have a *Flower*. In constituting of the *Genera*, the *Flower*, together with the *Fruit*, is requir'd; and in constituting of the *Species*, several other of the *Parts* may be admitted.

Being come to the *Method* it self, he first divides or distinguishes the *Plants* according to their *Structure*, in which respect they are either *Herbaceous*, or *Ligneous*. But whereas they are commonly distinguish'd into the *Arbores Frutices*, and *Suffrutices* which make up the *Ligneous*, and *Herbæ*, which make up the *Herbaceous* Part, he only chuses to use a two-fold, instead of the former four-fold *Distinction*, so that the *Herbæ* and the *Suffrutices*, and the *Frutices* and *Arbores* go together, not because he is not sensible that the *Suffrutices* have a *Ligneous* Substance, and a perennial Surface (for most of the *Suffrutices* are Evergreens) and are even *Gemmiparæ* in their woody Part, as much as the *Shrubs* and *Trees* are; but because of their low Stature and short Duration, and because to rank them separately would create a Disturbance in that Symmetry and good Order in one of the most fix'd *Classes* in all the *Botanicks*, for who would separate

Rosmarinus, Lavendula, Hyssopus, Thymus, from *Majorana, Mentha, Melissa*, without greatly dismembring of that Tribe; and who would be at Pains to separate *Abrotanum Mas*, from *Absynthium*, if there were no more in't than that the one has a woody, and the other an *Herbaceous, Medullary Stalk*?

2. In respect to their Flowerings. Thus the *Herbs* are divided into such as have conspicuous *Flowers*, and such as has have them not; or into the *Floriferous* and *Non-floriferous Plants*. The *Floriferous Plants* are, either *Monopetalous, Polypetalous, or Apetalous*. The *Non-floriferous* are such as have no *Flower*; but as the *Capillares* have a *Seed-Vessel* and *Seed*, and such as have neither *Flower* nor *Seed*, as the *Musci, Fuci, Fungi*.

The *Trees* are divided into five *Classes*, viz. *Flore Apetalo, Amentaceo, Monopetalo, Rosaceo, Papyronaceo*, so that in few Lines you have the Distribution of all the *Plantarum Genera* expos'd to View.

When he comes to the *Classing* of the *Plants*, he disposes of them according to such Shapes and *Figures* as are imagined by himself. But as the *Plants* themselves will not admit of such Distributions without a great many Inconsistencies, so he has been expos'd to the Censure of several *Authors*, since his *Institutiones* have been published upon that account; and so much the more, in that he puts so great a Value upon his own *Method*.

So that I suspect what he accuses Dr. Morison of, will more truly be applicable to himself, "*Summis laudibus excipendus, longè vero majoribus si à suis abstinuisset;*" for that he was *sui Plenus* upon his Performance (or as Mr. Ray says reproachfully of Dr. Morison, *Cum sibi nimis placeret*) is too evident from his own Words; *Mihi non parum Gratulor cui omnium postremo nescio quo bono fato contigit demonstrasse hanc Methodum, cæteris omnibus præstare & singulis Generibus ita aptasse ut magno Herbariorum commodo futurum sperare audeo.*

But leaving this, I proceed to the more particular Examination of his Classes.

Class 1. Flores Companiformes. These he divides into two Kinds: 1. If the *Bottom* and *Sides* are large, then 'tis a *Bell-flower* simply, as in the *Campanula*. 2. If the *Bottom* and *Sides* are contracted, then it is *Tubulous*, as in the Flowers of *Polygonatum Cerinthe*: But, 3. If the *Borders* are larger than the *Bottom*, then it is *Patens*, as in *Malva*. 4. *Globulous*, as in the *Arbutus, Ruscus, Erica, &c.* Notwithstanding of all these Distinctions, yet the Flowers in this Class will not bear the Test; neither has he been so very lucky in his Distribution by them, though they should bear: e. g. *Mandragora* has no Affinity with *Bella dona*, for the Flowers of the *Mandragora* are deeply divided, almost to the *Bottom*, the other
only

only divided superficially at the Borders; and *Mandragora* is rather *Pomiferous* than *Bacciferous*; *Bella dona* has an high branched Stalk; *Mandragora* has no Stalk, but its Flowers arise by several Pedicles from the Root, and has much larger *Leaves* than the other, and no wise like them. *Lilium Convallium*, *Polygonatum*, and *Ruscus*, are all three *Bacciferous* indeed, but they have no Relation by any other *Character*, except that there may be a small Resemblance in the Texture and Fashion, not Bigness and Disposition, of the Leaf, in the first two. *Sect.* 3.

The Plants here neither agree in the *Flower* nor *Fruit*, which are his two essential *Characters* never to be absent; for some of them are *Flore Tubulato*, as *Cerintbe*; some *Campaniformes*, *Tubulati* & *Patentes*, as *Gentiana*; some are *Unicapsular*, *Bicapsular*, *Multicapsular*; and then as to the *Plantæ Habitus*, scarce one *Genus* agrees with another; and there should still be some Regard had to that, in order to make a *Method* consistent. *Tithymallus*, *Glaux*, *Maritima* and *Oxys*, have no Coherence, and can never regularly succeed to each other in one Section. 'Tis justly doubted if *Oxys* be *Monopetalous*; and for the *Rhabarbarum* in *Sect.* 4. it has all the *Characters* with the *Lappatha*, to which it more properly belongs. *Apocynum* and *Asclepias* are indeed of kin, but they have little to do with *Cotylidon* for a Neighbour.

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The *Malvaceous Tribe* will not easily disjoin, though the *Flora Batava* does it in the *Ketmia*, as has been observ'd. The *Pomiferae* and *Bacciferae Scandentes*, come as well in here as elsewhere, nor will they easily separate; but I know not how *Campanula* and *Rapunculus* come to succeed next to them; nor how the *Rubia's* or *Stellatae* can be said to have a *Bell-flower*; I should rather think they belong to the *Flores Rotati*, by the Fashion of the *Flower*. They agree in nothing so much as in the Disposition of the *Leaves*; for *Rubia Tinctorum* is a *Bacciferous Plant*, though the Berries only contain two Seeds. *Aparine* and *Asperula* differ from each other by the Disposition of the Flower; for *Asperula* has its Flowers *Umbellatim Dispositos*; both of them have two *Capsular Seeds* succeeding, and therefore may be justly called *Gymno-Dispermæ*; but for the *Aparine Supina*, *Flore Cæruleo*, *Tournef. Rubia Parva*, *Fl. Cæruleosus Spargens*, *J. B. Rubeola Arvensis Repens Cærulea*, *C. B. * Dillenius* having strictly examin'd it, makes it a *Planta sui Generis*, and therefore makes a Present of its Name to Dr. *Sherard*, calling it *Sherardia*. The Account he gives of it is, "that by its Flowers it agrees with the *Rubeola*, (what *Rubeola* he means different

* Dillen Nova Plant. Genera, p. 96. Edit. Francofurt. 1719.

“ from this I know not) but different in
 “ the Figure and Disposition of the Seed ;
 “ for its *Flowers Embryoni gemello insiden-*
 “ *tes*, are *Funnel* like, or *Infundibulifor-*
 “ *mes*, *Tubulo nempe ut in Rubeola Longi-*
 “ *ori donati, nudi & Tetrapetaloides*, as the
 “ rest of that Class ; but the *Seeds* are *aculea-*
 “ *ta singulanempe tribus aculeis prædita*, so
 “ that to each pair of *Seeds* there appear six
 “ *aculei*. The *Flowers* and *Seeds* are ga-
 “ thered in *Capitula multis ad basin foliis*
 “ *radiatim ut in Asserisco Tournefort cincta*.
 “ These *Capitula* of *Flowers* arise from the
 “ top of the Stalk and Branches ; and there
 “ are for the most part to be observ'd eight
 “ Leaves in these, in which are contain'd fix,
 “ seven or nine Pair of *Seeds*. The *Seeds*
 “ are firmly united when green, but separa-
 “ rating when ripe, convex or turgid on the
 “ out side, and flat on the inside where
 “ join'd with the Partner. The *Seeds* are na-
 “ ked, as in the rest of this Class, (although
 “ J. *Bauhinus* says, they are *vasculous*, to
 “ whose Opinion *Knautius* and *Ruppius* also
 “ consent) for the Bark or *Vasculum* adheres
 “ very firmly to the Kernel or Seed, and
 “ there is no inner Cavity betwixt them. It
 “ does not agree to the above-nam'd *Syno-*
 “ *nyma*, for by its Seed it differs from the
 “ *Rubeola*, with which *Ruppius* thinks it a-
 “ grees ; for *Rubeola* has *Semina levia Re-*
 “ *niformia*, and therefore it cannot be ascrib'd
 “ to

“ to it, far less to the *Rubia*, with *J. B.* or
 “ *Aparine* with *Tournefort*, which has round
 “ rough Seeds, when these are rather ob-
 “ long, but prickly at the top, not to speak
 “ of the Difference of the *Flower*, being ob-
 “ long, *tubulous* and narrow; and that these
 “ upon the top of the Branches and Pe-
 “ dicles, (*è foliorum alis egressis*) are heap’d
 “ up in a *Corymbiferous* Manner in a plain
 “ Head, *multis foliis radiatum cinctis*. He
 “ says he has only observ’d one Species of
 “ this Plant, which is mentioned in the tenth
 “ Page of his Appendix †. Now the Plant
 “ he mentions there is the *Rubia Parvo*
 “ *Flore Cæruleo se Spargens*, *J. B.* which
 “ himself says is quite different from this.
 “ However, I have given the Figure of it as
 “ from him ‡, and shall look upon it as *Plan-*
 “ *ta sui Generis*, until another Season al-
 “ low me to examine the *Rubia* or *Rubeola*
 “ of *Baubinus*.” The celebrated Dr. *Sherard*
 is oblig’d to him for this deserved Testimony
 of his Esteem; but as Mr. *Vaillant* has made
 the like Present to the Doctor already, of a
 kind of *Verbena Americana*; and an *Italian*
Botanist has inscrib’d a third Plant to him.
 This Excess of *Civility* towards the Patrons
 and Correspondents, may turn to a bad Ac-
 count to the *Botany*, by an unnecessary Mul-

† Dillen. Append. ad Plant. Circa Giffam. p. 10.

‡ Tab.

tiplication of Names, or giving the same Denomination to Plants of so very different Tribes. The only way I see such an Inconveniency can be prevented, is by adding the Giver's Name to the Gift, such as *Sherardia Valentii*, and *Sherardia Dillenii*, &c.

But to return to *Tournefort*. He joins the *Gallium Palustre Album* to the *Cruciata*, because it has only four Leaves at a Joint; but since it has the same Flower, dispos'd after the same Manner, and since it agrees in nothing with the *Cruciata* but the Number of the Leaves, (for the *Cruciata* has *Flores magis Sparsos è Foliorum alis*) it should rather be continued with the other *Gallia Alba*, and *Mollugines Montanæ*, for without that he does Violence to his own Method, by robbing it of a just Regard to the Flower and Fruit, in putting such a value upon the Number and Disposition of the Leaf.

Class 2. In the first *Sect.* of the *Flores*, *Infundibuliformes*, I think *Centaurium minus*, as I have formerly observ'd, should have been plac'd next to *Gentiana*, or *Gentiana* next to it; for if *Gentianella* were made a separate *Genus*, (in the doing of which there would be no great Inconsistency) I should not scruple to call *Centaurium minus*, *Gentianella Autumnalis*, *Foliis angustioribus*, *Flоре magis Patente*. I have not indeed examin'd, whether it be *Bicapsular* or *Unicapsular*, with the others of this *Sect.* However

Quamoclit

Quamoclit may be said to have a *Flos infundibuliformis*, and upon that account separate from its Congener *Convolvuli*. I know not but *Menianthes S. Trifol. Paludos. Nicotiana, Hyoscyamus*, might as well have been reckoned among the *Flores Campaniformes*, as brought in here; and they seem to be so odly join'd in with *Stramonium, Auricula Ursi*, and *Pervinca*, three Plants which have no kind of Resemblance to each other, either in Flower or Fruit. Can there be any greater difference than a gross *Quadricapsular long Siliquæ*, and a small *Globular Fruit*? I should think the Flower of *Auricula Ursi* deserves as well to be among the *Fl. Hypercrateriformes*, as *Androsace* and *Primula Veris*; and for *Plantago*, were it not that he has laid down for a general Rule, that the *Petala* of a Flower never become the *Capsula* of a Fruit. This with the Brethren *Coronopus* and *Psyllium*, might have gone along with the *Flores Apetali sive muscosi*, by the outward Appearance; but there is somewhat to be said, because of their *Conical Capsular Fruit* opening transversely, which never happens to those which have *Apetalous Flowers*. That's a strange Conjunction betwixt *Jallapa Rubeola spicata* and *Valeriana*. The Flower of the *Jallapa*, or *Mirabilis Peruviana*, seems to me to resemble that of a *Convolvulus* more than any. The fourth Sect. contains those, otherwise called *Asperifoliae*, which

which though they do not all resemble each other by the Flower, yet by the four Seeds succeeding, by the alternate rough Leaf by which they are distinguished from the *Plantæ Flore Labiato*, and by the whole *Facies externa*, they cannot be well separated. Dr. Knaut would have *Echium* carried off, because it has somewhat of a Lip Flower, but that cannot be done without Violence, (*sans tort*) as the *French* say; for it would be a Stranger among them, as not being cloath'd in the same Fashion, whereas 'tis a Domestick, having the same Livery with these. *Nummularia* and *Anagallis Lutea*, cannot be conveniently brought into the same Family with the *Lysimachia Lutea*, but they may be admitted as Neighbours, and *Anagallis Lutea* may very well dwell with *Nummularia*; all the three love to possess the same shady Soil. I have brought *Pyrola Alsines* into the Family of *Anagallis*, since it was not formerly known to whom it belong'd; and although I have nam'd it *Pyrola Unicapsularis* in my *Miscellaneous Observations*, lest it should be mistaken for want of its former Name; yet I may very justly call it *Anagallis erecta unicaulis*, and I describe it thus; *It's a small Plant, not rising above two or three Inches high, unless nourish'd carefully in a Garden, with its Mother, black, mossy, fat Earth, for then it will ascend five, six, or seven Inches, with a stronger Stalk, and*
much

much larger Leaves. It has a small, running, white, knobby and fibrous Root, from whence arises a small, streight, naked Stalk, till it come to the top, when it is loaded with several dark-green pointed Leaves of different Bigness, some half Inch, others quarter Inch broad at the Base, and about one Inch, or one Inch and half, long; thick set, surrounding the Stalk: From the middle of these arises a very fine small Pedicle, bearing a small, deeply divided and pointed Flower, like unto the *Anagallis*, to which succeeds one Spherical Capsula, or Seed Vessel, opening transversely, and containing several small Seeds fix'd to a Placenta in the middle. Sometimes I have seen it bear two Flowers, each supported by a proper Pedicle, arising from the top of the Stalk amidst the Leaves. That which is peculiar to this Plant is, that the Leaves are never of the same Bigness, but some larger and others less. *Samolus Valerandi* is justly separated from the *Anagallis*, and *Veronica sive Anagallis aquat.* though it more resembles the latter than the former. *Tournefort* every where acknowledges *Dr. Morison* to have been the Author of the Distribution of the *Anagallides aquaticæ*, some of the *Alsine's*, and *Chamædryes Sylv.* among the *Veronica's*, which *Mr. Ray* does not, as has been observ'd. *Verbascum* and *Blattaria* are near of kin; but one would think *Chrysosplenium* or *Saxifraga Aurea*, and *Potamo-*
M nium;

nium, or *Valeriana Græca*, had no Relation to them. For the *Sect. 7.* of the *Bacciferae*, I have not yet seen any Distribution where these Plants have been so class'd together, as to agree in their less Essentials, such as the *Plantæ Habitus*; but *Cyclamen* seems to be a Stranger here. *Pimpinella Sanguisorba* is by some class'd among the *Flores Muscosi*, along with the *Plantago*; because neither of them have so conspicuous *Flowers*, as at the first view they may seem to be *Petalous*; but *Sub judice Lis*.

Class 3. The *Anomalous Flowers* are *Anomalous* indeed; for there is a strange *Miscellany* of different *Genera* of *Plants* huddled up here: *Arum* and his Brethren, *Dracuntium* and *Arisarum* are Friends; but what relation has *Aristolochia* with *Rapuntium Galeatum*, or *Digitalis* with *Bignonia*, the one having a *Conical Capsula*, and the other a *Long Siliqua*? Indeed these two have some resemblance in the *Flower*, and perhaps might have been brought in with the *Flores Campaniformes*, or *Infundibuliformes*, but neither of them agree with *Scrophularia*, and far less *Scrophularia* with *Pinguicula*. This last would have come better in with *Linaria*, in the fourth *Sect.* and *Linaria* should not have interpos'd betwixt *Antibirrinum* and *Asarina*; neither should *Melampyrum* have come in betwixt *Pedicularis* and *Euphrasia*. *Acanthus* is well plac'd by it self;

nor does it come in unfitly among the *Anomalous Flowers*.

Class 4. Is a Sett of Plants agreeing so well together, that they cannot well be misplac'd, if any will be at tolerable Pains to observe the Flowers; but I think it would have been no loss to *Tournefort's* Method, that he had some Consideration to the Leaf in the General Character of the Class, especially since there is another Sect of Plants which have the same Fructification with these, *i. e.* four Seeds, and sometimes in a *Tubulous Calix* too; where would have been the Harm to say, that most of these Plants have less Leaves than the other; that they have a smoother Surface than the other; that they are frequently odoriferous, often frutescent or ligneous, there being several *Suffrutices* belonging to this Class; and have always their Leaves arising by Pairs from the Stalk? These, and such like, less essential or distinctive Notes, would preserve them from being incumbered with Strangers, even though there were no regard to the *Spicate* and *Verticillate Disposition* of the Flowers; for otherwise how can *Echium* and other *Lip-flower'd Plants*, (which may yet be found) with alternate rough Leaves, be kept out. I think that's but a frivolous Objection which some make, concerning the Equality in the Segments in the *Mentha*, *Pulegium*, and *Marrubiastrum*, but I am not clear that *Pulegium* should be

adopted among the *Menthæ*. There is a *je-ne sçais quoy*, as the *French* call it, somewhat peculiar to each, which separates them, though they may well live together as Neighbours. The other objection against several of this Class, that they have not always four Seeds, I think is likewise of no moment; for generally speaking, they have the four *Embryones*, but the want of the Nourishment, or the Narrowness of the Bounds of the *Tubulous Calix*, may hinder them from coming all to Maturity; and several of them may fall off in the open *Husk*, before they come that Length. In some *Genus's*, as *Verbena*; the Seeds are long and very small, that they may be the better adapted to the Capacity of the *Calix*, which is erect, and lies close to the Stalk to preserve them from falling off before they be ripe. The Sect of the *Unilabiate Plants* is very distinct from the rest: But *Scordium* and *Scorodonia*, or *Salvia Sylvestris*, each of them deserve to be plac'd separately, though in the Neighbourhood of the *Chamædrys*, as well as *Calamintha* and *Hedera Terrestris* among the *Bilabiatæ*, may live near to one another, but not in the same Family.

Class 5. Is consistent enough in several of the Sections, and agreeable to the Distribution of most other Authors. *Sect. 1.* has an unusual Title; that its *Genera* are *Capsular*, not *Siliquous*, though it makes good what I have advanc'd, *Essay 2.* " That there may be a
" *Capsula*

“ *Capsula* which is not a *Siliqua*, but most of the *Siliquæ* may be call'd *Capsulæ*. All of this Section are *Monospermæ*, which likewise shews, that where there is but one Seed, that is not always naked, but frequently contain'd in a *Capsula*, as well as if there were severals. His changing of former Names, as *Rapistrum* for *Myagro Affinis*, C. B. *Myagræ* for *Myagræ Monospermon*, is ready to puzzle *Botanick Students*, and it is a Fault he's too often guilty of. Sect. 2 and 3. contain those Plants otherwise call'd *Plantæ Siliculosæ*; 'tis difficult to distinguish them from *Capsulæ*, but *invaluit usus*. I have already observ'd, that *Raphanus Rusticanus* may well be brought into the Neighbourhood, but will not allow the being admitted into the same *Genus* with the *Cochlearia*. Sect. 4. Contains the *Plantæ Flore Cruciformi*, or *Tetrapetalæ Siliquosæ*, *omnium Authorum*. *Raphanistrum Siliqua Articulata*, was formerly the *Rapistrum*. *Hypecoön* is rightly brought near to *Chelidonium Maj.* and it would not have been amiss that *Glaucium*, or *Papaver Corniculatum* had been brought hither also, notwithstanding the Largeness of the *Petala*. I know not how *Erucago*, *Potamogeton*, and *Herba Paris* come hither. I expected to have met with *Potamogeton* among the *Flores Apetalæ*, along with the *Persicaria*; and for *Herba Paris*, it should go somewhere among the *Bacciferae*, and not among this Class of the *Tetrapetalæ*.

trapetalæ, where none but *Siliquosæ* and *Siliculosæ*, or *Capsulatæ*, can regularly be admitted.

Class 6. Contains the Plants with a *Rosaceous Flower*. Here is such a jumble of *Dissimilar Plants*, or Plants of such a Diversity of *Genera*, no wise corresponding with each other, as can be found no where but among the Ancients, where nothing of Method was known, and therefore little regarded. The Disposition of the *Flower* makes the *General Title*, with this Qualification, that the *Petala* be *in Orbem Posita*, like to a *Rose*; but how *Circæa*, which has but two *Petala*, *Ruta*, *Onagra*, *Chamænerion*, &c. can be said to have *Petala in Orbem Posita Rosis æmula*, I know not. *Sect 1.* *Amaranthus*, if he will not have it to be an *Apetalous Flower*, as some do, it might have been join'd to the *Plantago*, for it may be look'd upon as *Monopetalous*, as well as the other; and they have the same Disposition into a Spike; the same *transverse opening Capsulæ*, and the same, or rather longer *Duration* of the *Flower*, as the other; *Portulaca* likewise seems rather to have a *Monopetalous*, than *Polypetalous Flower*. *Papaver* and *Opuntia* are vastly different, as also *Opuntia* differs much from *Granadilla*, *Murucua*, and *Mitella*, and *Alsine* from these; how can *Parnassia* come in with *Juncus*? and for *Kali*, as Dr. *Prestone* well observes, it cannot be said to have

have *Petalous Flowers*, unless the small *prickly, green Leaves* of the *Calix* be taken for such. Should I go on with the rest of this Section, to shew their Inconsistencies with one another, I should enlarge more upon this Subject than is convenient for my present Purpose. *Sect. 3.* *Geum* is rightly separated from *Sedum Bicornes*, or *Saxifraga Alba*: *Salicaria*, or *Lysimachia Spicata*, is a different Genus from *Lysimachia Lutea*, or *Chamenerion*, i. e. *Lysimachia Siliquosa*, and *Glaucium*, as is observ'd, may be plac'd else-where. *Sect. 4.* *Hypericon* being *Tricapsular*, the common *Androsenum*, called the *Berry-bearing St. John's-wort*, is made a separate Genus, as *Unicapsular*. And *Hypericon Montis Olymp. Wheel.* is separated from it by the Name of *Ascyrum*, because it is *quincapsular*. The other *Androsema* and *Ascyra*, are join'd with the *Hypericon*. *Sect. 6.* *Sedum* and *Anacampseros*, are Neighbours good enough, but they seem not to be of Kin with *Ulmaria*, nor *Barba Capræ*. *Geranium*, is a large Genus; but if the Fashion of the *Flower* is rightly considered, they should be certainly divided into those which are *Petalis Æqualibus*; and *Inæqualibus*, as is rightly observ'd by *Rivini*, though both have the same kind of *Capsular Fruit*. *Sect. 7.* *Anemone* is a large Tribe, and differs from the *Ranunculi* by the *large, oblong, downy Head*, and somewhat else peculiar to its *Facies*

Externa, which cannot be express'd. *Tournefort* makes the *Anemone Nemorum* a *Ranunculus*, but I would chuse with *Dr. Hotton*, in his Letter to *Mr. Ray*, to make it a separate Genus from both the *Anemone* and *Ranunculus*, as partaking of both, and not wholly belonging to either; for it has a *single*, naked, *solitary*, *Polypetalous Flower*, without a *Calix*, an undivided *Stalk*, strictly surrounded by three Leaves, in all which it agrees with the *Anemone's*; but its Fruit, consisting of several naked *Seeds* (*in Capitulum Collecta*) is like to the *Ranunculus*. I think it may still retain its former Name, rather than with *Dr. Hotton* to call it *Anemonoides*, *Anemone Ranunculus*, *Ranunculus Anemonoides*, or with *Dr. Tournefort*, to call it *Ranunculus Nemorosus*, thereby to confound it with other Species having that Epithet. I have already observ'd, that the *Chelidonium Minus*, *Hepatica Nobilis*, *Adonis*, *Plantago Aquat.* however join'd with the numerous Family of the *Ranunculi*, yet they have all somewhat peculiar to themselves, which may still make them be look'd upon as distinct Genera. The *Plantago Aquat.* being a *Tripetalous* Plant, is not enough to swallow it up among the *Ranunculi*; but it may very well have for a Congener the *Sagittaria*. *Fragraria* is not ill plac'd betwixt the *Caryophyllata* and *Pentaphyllum*, though it be *Bacciferous*; and if *Rubus* did not properly come in among the *Frutices*,

Frutices, it might be made a Neighbour to the *Fragraria*; as also *Chamærubus*, commonly *Chamæmorus*, which is a low, creeping Plant, for all of them have a *Fragraria*, Flower, and Berry. *Christophoriana* and *Asparagus* may be join'd together, because of their being *Bacciferous*, though otherwise they differ in the *Facies Externa*; but of this already, as also of *Circea*, *Agrimonia*, and the rest of this *Seçt.*

Class 7. The *Flores Rosacei*, and *Umbellati*, or otherwise the *Umbelliferous Plants*, are a Tribe which is now come to a good Consistency. As to the Distribution, Dr. *Morison* was the first who brought these to any regular Conformity; if he had let his *Umbelliferæ* *improprie Dictæ* alone, for by bringing them in, he shew'd a greater regard to the *Plantæ Habitus*, than was consistent with the *Method* he propos'd, which was the *Fructification*: but *Herman*, who follows his Distribution, has omitted them. Mr. *Ray* has another Disposition of them in his *Methodus Emendata*, regular enough. *Tournefort* has added *Eryngium* and *Horocotyle* to *Sanicula*. Mr. *Ray* seems to accept of the *Eryngium* (though he gives its Notes elsewhere) but loves not to admit of the *Hydrocotyle*, leaving it to be among the *Aquaticæ incertæ Sedis*, though if several *Pentapetalous Flowers* (*in Capitulum Collecti*) to which succeed two Seeds, be a Note, he'll not get rid of it.

Class

Class 8. Of the *Plantæ Flore Caryophyllæo*, is a short *Class*, but consistent enough for the *Caryophyllus* and *Lychnis*; but *Linum* might have been among the *Flores Rosacei*, as properly as some others; as also the *Cucubalus*. And for the *Staticæ* or *Caryophyllus Montanus*, more properly *Maritimus*, for that's the Soil it affects most, I think it should have rather been plac'd among the *Flores Compositi*, or *Flosculosi*, near to the *Scabiosa*, both in respect of the Flower and Seed; and for *Limonium*, it might have come in among the *Monopetali Infundibuliformes*, but he has accounted for that already in his *Isagoge*.

Class 9. The *Flores Liliacei*. This is a very perplex'd and confus'd *Class*, notwithstanding which there seems to be somewhat inviting in them; and for enticeing of *Botanists* to bring them together into one *Class*, to consider their Roots, most of them, are *bulbous* and *squamous*. Several *Geniculate*, others *knotted* and *fibrous*, not *squamous*; and others *fibrous*, not *knotted*; their Leaves are all simple, undivided, arising without Pedicles, chiefly from the Root, with a strait Stalk in the middle, seldom branch'd but at the top, in order to carry the more *Flowers*, which sometimes are more loosely dispos'd, at other Times more compact; and in *Capitulum Collecti*. The Leaves are either long, flat, and broad (*Lanceiformia*) *Spear-like*, or narrow *Graminei-Folia*, or *Tubulosa*,

losa, hollow, as the *Cepa*. The *Stalks* are either *Nudi*, as in most of the *Genera*, or *Foliosi*, having several Leaves accompanying the Stalk, either *alternately*, or *Radiatim*, as in several of the *Lillies*; their *Fruit* is *Tricapsular*. In a word, their *whole Facies Externa*, requires them to be class'd all together; neither do they disagree so much in any thing, as in that by which *Tournefort* is oblig'd to class them, *viz.* their Flower; for both by their Structure, Disposition, and Number of their *Petala*, they differ most of any other part of the Plants, *v. g.* Some of them are large, as the *Lillies*, *Tulips*, *Flower-de-Luce*, &c. Others very small, as *Allium*, *Cepa*, *porrum*, &c. most of them have equal Segments, or *Petala*, but some unequal, as the *Irides*, *Gla-diolus*. Many of them are *Monopetalous*, divided into six Segments, as *Asphodelus*, *Colchicum*, *Crocus*, *Narcissus*, *Iris*, *Hyacinthus*, justly divided into three *Genera*, *Tubulosus*, as *Hyacinthus propriè dictus Globosus*, by the Name of *Muscari*, and *Stellaris Ornithogalli Species*; some are *Tripetalous*, as *Ephemerum sive Phalangium Virginianum*, and all the Remainder are *Hexapetalous*, so that he had good Reason to say, that he did not class them so much upon the account of their Flower, as their *Tricapsular* Fruit. However this may be made an Objection against his *Method*, I wish there were no greater Inconsistencies in it than this; for as there is no
altering

altering the determinate Rules of *Nature*, so it was better to bring all these together by some one essential *Character* (and the *Fruit* is not the least essential) than to suffer them to remain dispers'd, as they were before *Method* was so much in Request.

Class 10. Is so regular and determin'd, that the *Papylonaceous Flowers* cannot well be separated from each other; for besides their *irregular Flower*, (as *Rivini* expresses it) for the most part *Tetrapetalous*, and some *Bipetalous*, and *Tripetalous*, as has been observed, they have peculiarly belonging to them, that their Seed is always *Capsular*, or rather *Siliquous*; generally speaking they are *Scandent*, with an infirm Stalk; but sometimes it is otherwise, as in *Lupinus*. Their Leaves are either *Bina*, two *smooth Leaves* arising by Pairs from the Joints differently dispos'd from the *Verticillatæ*, *Terna*, three Leaves upon one *Pedicle*, as the *Trifoils*, *Quina*, five Leaves, as the *Lotus's*, viz. three larger, and two less, or *Pinnata*, several arising by Pairs from a *Mid-rid*, as *vicia*, *Orobus*, ending in a *Clavicula* or *Climber*, or without a *Clavicula*, but having a *Folium impar extremum Claudente*, as *Gallega*; or lastly, *Digitata*, as *Lupinus*. In a word, by the *Facies Externa* 'tis very easie to distinguish a *Papylonaceous Plant*, from all others, even before either *Flower* or *Fruit* appear, especially by the *Taste*, which is peculiar to those of this Plant,
being

being for the most part sweet, more or less conjoin'd, with a bitterish Taste, usually known by the Name of a *Pea-Bloom-Taste*, as *Sir John Floyer* has it. Its *Siliquæ* are sometimes *Monospermæ*, as the *Trefoils*, *Planæ*, and more or less *Tumidæ*, as the *Pisa*, *Fungosæ*, as the *Faba*, *Articulatæ*, as *Securidaca*, *Hedysarum*, in *Colchææ formam convolutæ*, as *Medica*, *Cochleata*; *falcis in modum re-torta*, as *Medica*, *Falcata*, &c. All these *Sili-quæ* are *Bivalves*, opening from one end to the other, each Seed has a separate *Placenta*, for the most part dispos'd in Rows, frequently about the Number five, but sometimes extending to seven or eight, as in the *Pisa*, but very seldom nine, of a *Spherical Figure* in that *Genus*, but in most of the other *Reniformia*, and sometimes *Quadrata*, as in the *Fænum Græcum*.

Class II. Still shews the Inconveniencies which happen, upon the placing the Characteristick Note in one part of the Plant, particularly the Flower. For, 1. There is a Necessity of separating from the other Classes or *Genera*, what ever will not agree with such and such a Flower, which being different from that, and from all other Classes, where the Flowers are of such a determinate Shape and Disposition, must therefore be *Anomalous*. 2. By so doing these *irregular Flowers*, which could not be join'd with the *regular Classes*, must be taken from them, even though they might have

have otherwise agreed in the *Fruit*; so that they who might have made up a *regular Disposition* if *class'd* by the *Fruit*, must now be condemn'd to a perpetual *Irregularity*, both in *Flower* and *Fruit*, since it is not to be expected, any two *Genera* can agree throughout a whole *Class*; so that the Character of this *Class* is, that its *Regular* in nothing but in *Irregularity*, as it's said of some, that they are *Constant* in nothing but in *Inconstancy*: But if a *Regularity* is to be at all endeavour'd, I should chuse to place *Cardaminum*, or *Nasturtium Indicum*, next to the *Viola*, and *Fumaria* before *Balsamina*, that it might have a View at a Distance of the *Papylonaceous Flowers*, to which it has some Resemblance: And *Luteola* might have been safely brought at least to the *Orchides*, since there is nothing in the Title of the *Sect.* that could hinder it, *Flore Anomalo cujus Pistillum abit in Fructum*, being pretty general, and the *Flowers* of the *Luteola* are not unlike *Helleborine*, *Oprys*, &c.

Class 12. Herbæ Flore flosculoſo, is a large Class, and comprehends two or three *Genera* of Mr. Ray, besides others adjoin'd to it; as the *Corymbiferae Nudæ, Capitatae*, &c. besides other Plants *Tournefort* is pleas'd to join with it. *Sect. 1.* Contains the *Plantæ, Flore Flosculoſo Sterili, sive à fructu remoto*, as *Xanthium, Ambrosia, Gnaphaloides*. To which may be added, (if *Dillenius's* Observation hold good)
Gnaphalium

Gnaphalium Montanum, *Flore Rotundiore*: for he says^g, “ There appear to be two
“ Species of this Plant, yet they are not
“ different Species, but different Sexes, for
“ those which have longer, are *Female-Flowers*, and they whole Flowers are rounder, are barren, or *Male-Flowers*, to which either two Seeds succeed, or only empty Husks”. I confess, I have seen both *Species* often grow together, and was ready to distinguish the two Species into *Flores Nudi*, such as he says have *Male flowers*, and *Flores Radiati*, such as he calls *Female*, or *Fertile Flowers*; but I am not certain, until a new Opportunity of observing it more narrowly do offer; if it is so, ’tis probable both may be from the same Root, and thus it may come in with this *Section*. And it is not unlikely, that what he says is true, for running Plants are not very fond of producing *Seed*, most of the Nourishment being spent upon the running Roots, and pushing forth of *new Shoots*; therefore those with the *Long* or *Fertile Flowers*, are by far the more rare. This Flower likewise varies into a reddish or Blush Flower, and into a pure White. *Sect. 2.* Contains most of the *Capitatae*; the fourth has the *Corymbiferae Nudae*, as *Absynthium*, &c. of which we have treated already. In this *Sect.* is contain’d the *Bidens*, from the two

^a Dillen. Cat. Plan. Circa Gissam. p. 60.

Spinulæ of the Seeds; but Dr. *Sherard* from Mr. *Bobart* informs Mr. *Ray*, that this is an Error; for, says he, the Seeds of these Plants, (as of many of the other *Corymbiferae*) have four *Spinulæ* each, though two of them generally, or in many Plants, fall off before they are ripe; in others only two remain. These *Spinulæ* are also observable in the *Semen Cardui Benedicti* by *Tournefort*, called *Cnicus*; and their Number is usually according to the *Striæ* in the Seed it self. He joins *Scabiosa* and *Dipsacus* together in one *Sect.* but *Knaut* is not of that mind, as shall be shewn.

Class 13. Treats of the *Herbæ Semiflosculosæ*, call'd by Mr. *Ray*, and several others, *Naturâ plenè Lactescentes*, or *Pappescentes* & *Lactescentes*, or *Planipetalæ Lactescentes*; but as none of these touch the true *Character* of the *Class*, except that of *Planipetalæ*, I look upon *Tournefort's* Title to be the best. These agree so well in their *Characters*, other *Accidents* and *Virtues*, that there is no separating of them almost, if one had a mind to do it; their *Genera* are distinct enough, but it is not easie to know each particular *Species* by its distinctive Note, v. g. In the *Hieracia*, &c. they are divided naturally enough into those *Seminibus Papposis* and *Non Papposis*. They have all an agreeable bitterish Taste, are cooling and refreshing, being good for Sallads, as *Lactuca*, *Sonchus*, *Endivia*, for blanching or Winter Sallads, as *dens Leonis*

nis, for Pickling or Pot Roots, as *Cichoreum*, *Scorsonera*, *Tragopogon*, &c.

Class 14. Containing the *Plantæ Flore Radiato*, comes next. These consist of the *Discoïdes*, *Seimne papposo* of Mr. Ray, making up the first *Sect.* as *Aster*, *Virga Aurea*, *Jacobæa*, &c. or *Corymbiferae Radiatæ*, *Seminibus Solidis*, as *Calendula*; all of this *Class* answer their *Title*, and are easy to be distributed.

Class 15. The *Stamineous* or *Apetalous*, is a large *Class* of *Flowers*, but easy to be distinguish'd from all others; nor is it difficult to distinguish any of the *Genera* from their *Congeners*. The first *Sect.* indeed does not so well agree, for *Asarum* has no Resemblance to *Beta*; *Acetose* and *Luppatha* agree better; and I have observ'd, that *Rhabarbarum* might have reasonably join'd with them. *Atriplex* and *Chenopodium*, are deservedly made distinct *Genera*. There are great Mistakes concerning the *Herniaria*.

Dr. Prestone at *Edinbrugh*, that accurate Botanist, trusting too much to *Tournefort's* Account of it, (as himself afterwards acknowledges) says, "it has a *Quadriphyllous Flower*, whose *Pistillum*, (in *Tournefort's* Language) becomes a *membranous striated Capsula*, divided into eight Pouches, like to the *Linum Catharticum*, each containing a small *Semen Ovato-acuminatum*: For which *Dillenius* takes him smartly up, charging

ing him with no less than Unskilfulness or Ignorance in *Botany**; which is too severe, considering the small Acquaintance he had of Dr. *Prestone's* Knowledge that way; and if he had read a Letter writ by the Doctor to Mr. *Ray* since that time, he would have retracted his former harsh Sentence, and would have found it is the same with his *Radiolus*, as he suspects; for Dr. *Prestone's* Account of the *Herniaria*, in the forementioned Letter, published by Mr. *Derham*, among Mr. *Rays* Posthumous Letters, is thus.

“ I have been mistaken, says he, in the former Account I gave you of *Herniaria*, following too much the Faith of Dr. *Tournefort*, not having examin'd it nicely enough my self. Therefore what I have discovered since is as follows. *Herniaria* Ger. *f. B.* has a *Tetrapetalous* and *Herbaceous Flower*, whose *Pistil* becomes a *Membranaceous Carinulate*, or *Striat Capsule*, like the Fruit of the *Linum Catharticum*, divided into eight *Loculaments*, in each of which is contain'd one small *Seed Ovato-acuminatum*, besides the four *Herbaceous Petala*, that are green without, and white within. It has also several *Stamina*, but those *Petala*

* Cæterum videtur nobis *Prestonum* loco allegato *Radiola Nostra* Characterem attribuisse & confudisse cum *Herniaria*, planta vulgaris notitiæ; quod de peritiâ ejus *Botanicâ* magnum Testimonium dare non potest. Dillen. Cat. Plant. Sponte circa Gissam nascent. p. 88.

“ never become the *Involucra Seminis*. This
 “ is what I have found on repeated Observati-
 “ ons. *Tournef. Instit. R. Herb.* places it in-
 “ ter *Herbas Flore Stamineo cujus Pistil-*
 “ *lum abit in Semen Calice Obvolutum*. But
 this Plant cannot properly be called *Stamine-*
ous, for the *Petala* or *Calix* never become
 the *Capsula*, or *Involucra seminis*; but they
 have a third *Membranaceous Capsula*, as a-
 bove describ'd. You have also (says he to
 Mr. Ray) given it a *Stamineous Flower*, con-
 sisting of four *Herbaceous Petala*, and plac'd
 it among the *Polygonums*; but whether it
 can be properly called *Stamineous*, I leave to
 you to determine.

Qu. If *Herniaria* Ger. J. B. page 69. *Syn-*
nopsos be a distinct Genus from the *Mille-*
grana Minima, Syn. page 207. The last is
 plac'd amongst the *Vasculiferous* Plants, with
 a *Pentapetalous Flower*, but more particular-
 ly amongst the *Alsines Species Anomala*,
Flore Tetrapetalo. This Note seems to a-
 gree, even to the *Herniaria* Ger. J. B. in
 that it is *Vasculiferous*, and has a *Tetrape-*
talous Flower; so that they seem not to dif-
 fer much in the *Flower*. The Reason of my
 Question is, because all those I had opportunity
 to examine, both in *Ericetis*, in Lee Grounds
 and in Corn Fields, I could not observe any
 Difference in the Characteristick, only in the
 Growth. I shall not question but there may
 be two distinct Genus's under that Name, but

could not be satisfied of it by your Observation.

This is the very Plant which *Dillenius* is so afraid to be rob'd of its Discovery, that he has honoured it with a new Name, calling it *Radiola*, thus describ'd by him: " There is
 " a small Plant, which, because its *Capsulæ*
 " or *Vascular Pouches* are *Rotatim* & *Ra-*
 " *diatim Disposita*, we shall call *Radiola*.
 It has *Tetrapetalous*, *Rosaceous* Flowers, to which succeed Seed-Vessels, consisting of eight Pouches, which containing small, yellowish Seed; the Flowers and *Vascula* are both so small, that they must be observed by a Microscope.

Thus far these two accurate *Botanists*, concerning a Plant so very small, that it is never to be seen but when bearing Fruit; but since I have seen it for several Miles together, on the Sides and the middle of Highways, usually in the Prints of Horse Feet, which had been full of Water in the *Winter*, and is dry'd up in *Summer*. I shall give the following Account of it. *It has a small fibrous Root, and a small strait Stalk, not above the grossness of an ordinary small Pin when about an Inch high or more; when more luxuriant it sends forth one Pair of small, oblong Leaves, not above one Line long, and half a Line broad; and è Foliorum Alis arise two Branches, and these again are sub-divided into other two, and so on, always arising*
 è Fo-

è Foliorum Alis to the top, which terminate in the above described Flower and Seed-Vessel. I shall not determine whether the Flower is Petalous or not, but if so, then they are Petala non Decidua, for in as far as I could discover, it has either the Petala always accompanying the Seed-Vessel, or it has a Pair of Foliola at the Bottom. I shall not say 'tis a true Millegrana, but I may safely reckon it, sometimes Centum Grana, for it has ordinarily sixteen or twenty Branchings, supposing the least, which is sixteen, and that each Seed-Vessel has eight Seeds: This makes one hundred twenty eight; and I may positively aver, that I have seen it have above thirty Branchings or Flowers, for its very bushy, otherwise it would not be so perceptible by one on Horseback: 'Tis the least Plant with a regular Flower that perhaps is known, and is justly called all Seed. The Millegrana major is truly a Polygonum, by a Specimen Dr. Sherard was pleas'd to shew me; but I am not so well acquainted with it as with the other, which it seems is rare in France, and I am told, not very frequent in England nor in Germany, which made Dillenius so fond of his Radiola. The Specimen which Dr. Sherard shew'd me, and which was of a pretty large size, was sent to him from France, with a Quære, they being ignorant there what it was; so that 'tis no wonder if Tournefort has not described it: But enough concerning

so small a Plant. I know not whether *Alchymilla* shall be reckoned *Apetalous*, but it has four upper small pointed *Petala*, which seem to be supported by four small under Leaves of the *Calix*, so that it must either be *Octophyllous*, or *Tetrapetalous*, and *Tetraphyllous*. Indeed, the *Herbaceous* Colour would seem to import its being *Apetalous*, though its of a more yellowish green, when it makes toward the Flower, than elsewhere, as the *Horminum Hortense*, when the *Spike* begins to make towards the *Flower*. I should not have grudg'd the *Potamogetons* a Place among the *Apetalous* Flowers, if Dr. *Tournefort's* more nice Observation had not determin'd the contrary : So that *Persicaria* shall have leave to remain here alone. I make no doubt of *Parietaria* being *Apetalous*, but it deserves to have *Chenopodium* for its Neighbour, for I have seen some of its Species stretch forth the *Stamina*, and shed the Dust, as it do's. *Polygonum* and *Bistorta* would gladly be lookt upon as *Petalous Flowers*; for the Leaves of their *Calices* belie the *Petala* very much, being *colore insignes*, especially on the inside.

Sect. 3. Consisting of the *Frumenta* and *Gramina*, are so well establish'd by the Resemblance they have to each other, and by the common Consent of all Authors, that I need not offer to make any Remarks upon them. The two following Sections, the one having *Male-Flowers*, and *Female-Embryones*

ones upon the same Plant, and the other having them in different Plants of the same Species, are consequential enough, only I think *Urtica* should have been join'd with the former, and not with the latter, for I have very often observ'd, That *Urtica Romana Pilulifera*, has the *Racemi* of *Male-Flowers* upon the same *Stalk*, and *Branches* with the *Pilulae* of *Seeds*; and if so, I doubt not but it may be in other Species of the *Urtica*, after the same manner, (though I ingenuously acknowledge, I have not been at Pains to enquire) for Nature do's not use to vary in Things of such Consequence as the manner of *Fruetification*. For *Equisetum* Mr. Ray observes, " That some of the Species of the "*Equisetum* seem to produce the *Fruit* or "*Flower* upon peculiar, naked Shoots or "*Surculi*, and distinct from the *leafy Stalk*, "*before the other Stalks break forth. O-* "*thers are Spicatum Digesti* upon the top of "*the leafy Stalk*, and therefore he reasonably suspects the ingenious Dr. Preston's Observation, That *Equisetum Sylvestre tenuissime Divisum* has round white Seeds, "*like to those of some of the Musci*, upon "*a small Pedicle, half an Inch long (Plane Capillaceo ;)* but Mr. Ray justly doubts "*whether these may not be more properly* "*Seed-Vessels*"; and I suspect they are rather *Apices* upon the top of fine *Stamina*; for as the use of the *Apices*, and their con-

taining of the *Farina Fæcundans*, was not well understood in his Time, he might very reasonably have mistaken the one for the other ; for as Seed-Vessels or Seeds, are seldom upon the the top of a small Pedicle, without there had been a previous Flower, so there is nothing more ordinary among the Stameneous Flowers, than for the *Apices* to be upon the top of the *Stamina*, at some Distance from the *Stalk*, when the Seeds are lodg'd in *Foliorum Sinubus*, or upon the top of the *Stalk*, to be impregnated by the *Farina*, blown in upon them by the Wind from the *Apices*, as *Tournefort* expresses it : *Fructus enim Species Equiseti innascuntur*, says he, *quæ Floribus carent, grana nempe Auctore Cæsalpino nigra aspera & farcta* (^b). This is also to be observ'd in the *Kali Geniculatum*, whose Flower consists of several single *Stamina*, each loaded with an *Apex* sticking out, as in the *Gramina* when the Seeds are lodg'd among the *Genicula* themselves.

“ *Dillenius* separates the *Hippuris*, as he
 “ calls it, from the *Equisetum*, because it
 “ wants the *Clavi* and *Surculi* of Flourishes;
 “ and instead of these has small, solitary, and
 “ dispers'd Grains (which he rather supposes
 “ to be Flowering than Seminary, having no
 “ Pedicles betwixt the *Folia* and *Setæ*; be-
 “ sides that, the Stalks are not articulated *Pixi-*

^a Rail. Emen^{ty} p. 20. ^b Instit. R. H. 532.

datim, as in the *Equisetum* ^c. I have added these Things, not from my own Observation, but from the fore-cited Authors, that I may persuade the curious to pry more narrowly into the *Fructification* of this singular Plant.

The *Fructification* of the Plants in the two remaining Classes, *viz.* the *Capillares*, *Musci*, and *Fungi*, &c. having been examin'd by several curious Authors already, and being more the Objects of *Microscopical* Observations, than *Ocular Inspection*, I have omitted them, because they make nothing to my Purpose, since what I have propos'd to advance in this Treatise, may be observ'd by any Person with the naked Eye.

The *Shrubs* and *Trees* which are contain'd in the remaining Classes of this *Method*, as they can be more conveniently class'd by the *Flower* than the *Herbs*, so I shall insist but little upon them, only that I shall give an account of their several Distributions, recommending the Examination of their *Fructification* to other curious Persons ; for any Observations I have made upon the Structure of the Flowers, they shall be contain'd in the next *Essay*.

Class 18. Contains the *Trees* with *Apetalous Flowers*. *Sect.* 1. Of those whose *Flowers* are conjunct with the Fruit, as *Fraxinus*. *Sect* 2. Of such *Trees* and *Shrubs* whose *A-*

^c Dillen. Nova Plant. Genera. p. 88.

petalous Flowers are upon separate Branches, from the Fruit upon the same Plant, as *Buxus*, *Erica Baccifera*. Sect. 3. Of the *Trees* and *Shrubs*, which have the *Flowers* separated from the *Fruit* upon different Species of the same *Genus*.

Class 19. Treats of the *Juliferous*, *Nuciferous*, and *Coniferous Trees*, as *Nux Juglans*, *Corylus*, *Abies*, *Pinus*, &c.

Class 20. Contains the *Trees* with *Monopetalous Flowers*, which only has one *Genus*, whose *Flowers* are separated from the *Fruit*, as the *Viscum*, whereof several other *Species* than these to be seen in *Europe*, are known to the *Celebrated Dr. Sherard*, whose *Texture*, *Structure*, and *Chymical Analysis*, has been most *nicely* and *curiously* examined by the *diligent* and *accurate Dr. James Dowglass*, R. S. S.

Class 21. Contains the *Trees* and *Shrubs* with *Rosaceous Flowers*. These answer in the Resemblance of their Figure, better to that of the *Rose* than the *Herbs*, though some of them are not fully so like it as were to be expected, in order to denominate a *Class*; but as he has once made this Distribution of them, and as several have followed his Example, they are not now to be chang'd without a new Confusion in *Method*.

The last *Class* is that of the *Trees* with *Papylonaceous Flowers*; these are generally known by their Figures, whatever be the
Number

Number of the *Petala*; and as their Fruit is always *Siliquous*, so he divides the several *Sections* according to their Leaves.

This being the second Method where the Plants are distributed according to the Flower, I proceed to the *Third*, which is that of *Christianus Knaut, M. D. Archiater Anhaltinus & Bibliothecarius Halensis*. This, as *Dillenius* observes, is a Mixture of *Rivini* and *Tournefort's* Method, but as it wants not its own Defects no more than the others, so it do's not want its own good Qualifications, the Distribution of the Flowers being made as regular as the Nature of the Thing will require, but it will not hold good upon all Occasions.

Knaut's Method.

His first *Class* is of the *Monopetalous Flowers*, and these he divides into two *Sections*, *viz.* such as are *Flore Uniformi*, and such as are *Flore Difformi*; but as the general Rules he lays down for constituting this *Class*, as indeed most of other *Classes* of his Method, are faulty, so whatever Distributions are made in consequence of these Rules, must be faulty also, *v. g.*

1. He divides the *Flowers* into *Flores Perfecti* and *Imperfecti*. I have already observed how unsuitable this Distinction is, and I cannot acquiesce in Mr. *Ray's* Distinction of a *perfect Flower*, according to him (*viz.* That a *perfect Flower* is such an one as always has *Petala*) for Reasons already given.

2. That

2. That the *Stylus* is no part of the Flower, but that it rather belongs to the *Fructification*. Now although *Malpighi's* definition of a *Stylus*, may and do's hold good, viz. That a *Capsula* nourishes, or rather preserves the Seed within its Cavity, yet its Appendix (commonly call'd the *Stylus*) only arises and appears among the *Stamina*; tho' it is not deny'd, that both the *Capsula* or *Pistillum* and *Stylus*, make up the *fructifying* Part, yet since, according to *Dr. Grew*, it makes up a part of the *Attire*, which he calls the *Seminiform*; and since no fertile Flower, when the *Pistillum* becomes the *Fruit*, is to be observ'd without it, except a few (such as *Papaver Capitatum*, and such like of that *Genus*) its Presence is as much requir'd to make up the whole *Compositum* of the *Flower*, as the *Petala* themselves.

3. That the *Stamina* are wanting in several, particularly the *Flores Aggregati*, such as *Flos Solis*, *Cyanus*, &c. This is a Mistake, for I have shewn that all the *Flosculi*, and *Semiflosculi* in these kinds of Flowers, have actually *five Columns* which arise from their inner Surface, as the *Stamina* in other *Monopetalous Flowers*, which afterwards coalesce and make up the *Vagina* in the *Flos Solis*, *Calendula*, *Hieraceum*, &c. And the Reason why they want the *Apices* here is, because the *Stylus* or *Capillamentum* upon the top of the *Embryones* supply their Office, by
emitting

emitting Globules full of the *Farina* at their upper Part.

4. From whence he concludes, that no *apetalous* can be a perfect Flower, since the only Fence of a *Flower* consists in its being *petaloid*.

5. The *Fegopyrum*, *Bistorta*, *Persicaria*, &c. have naked, *petalous Flowers*, according to him, and therefore he says Mr. Ray is in the wrong for calling them *Perianthia*, according to his own *Definition*: That it do's not follow that the *Petala* are to be call'd *Perianthia*, because the *Flower* is not *Fugax*, nor *Caducus*, otherwise several *Petala* would be called *Perianthia*, which is contrary to known Experience: All this is own'd, and yet that do's not make the *Bistorta*, &c. have *petaloid Flowers*, for although their *Perianthia* be *Colore insignes*, which is one of *Tournefort's* Definitions of a *Petalon*, yet they become the *Capsulae*, or *Involucra Seminis*, which the true *Petala* never do, and are to be reckoned *apetalous*, therefore he justly observes, that *Helleborus Niger*, and *Veratrum*, are *petaloid Flowers* (which we have also remark'd elsewhere) because their *Petala*, although not distinguish'd much in the *Colour*, yet they never become the *Involucra Seminis*. The other *Articles* are much of a Piece with these, and therefore we shall not insist upon them.

When

When he comes to constitute his first Section of *Monopetalous, Uniform Flowers*, he takes it for granted, that neither the *Perianthium*, *Stylus*, nor *Stamina*, are Parts of the *Flower* (the contrary of which is immediately shewn) and therefore calls it that whose *Margine* is whole, or whose several *Portions* or *Laciniae* are equal in respect to one another. And so he goes on in reducing all his *Monopetalous, Uniform Flowers* into a general Table, whereof *Valeriana* takes the first Place. *N. B.* I have observ'd, when discoursing of *Rivini's* Method, if the *Regularity* and *Irregularity* of a *Flower* is to be establish'd for a Character, several Inconveniences must follow such as that of separating of those Plants reckoned *Congeners* by all other Authors, merely upon the account of a nowise essential Circumstance of the Division of the Borders of a *Flower*, or the *Segments* and *Division* of a *Leaf*, which if always adverted to, would create needless and endless Trouble to *Botanists*, whereof this is a most pregnant Instance: *Valeriana* is class'd among the *irregular* Flowers by *Rivini*, which, as I said, unless it can be extended throughout all the Species of the whole *Genus*, deserves not to be admitted as a *Characteristick*, which it does not; for here *Dr. Knaut* places it among the *Uniform* or *Regular Flowers*, as the *Valeriana major Alba* do's indeed require; but since there are some Species of that same *Genus*

nus which have *irregular Flowers*; therefore either Dr. *Knaut* must recede from his Institution, or have the Honour of framing a new *Genus*, which I think is rather a Loss than an Advantage to *Botany*, when done upon the account of a mere Trifle, and against the common Consent of all Authors, v. g. *Valeriana* has a small, *tubulous, monopetalous Flower*, divided at the top into five *equal Segments*. It has a compound Leaf, or *Folium Pinnatum*, *Valeriana Minor Latif. Rub. & Alba. Moris.* has the same small *Flowers Umbellatim Dispositi*, but each of them are divided into five *irregular Segments*, like a Thumb and four Fingers, because of which and an undivided Leaf, though it be *Seminibus Papposis*, it must be sent a packing to another *Section*; and because the Affront upon it dare not appear abroad under the former Name, but must be distinguish'd by the Name of *Valerianoides*; and should another Plant like unto this *Valerianoides*, be yet found out, if it should have *equal Segments*, or rather the *Segments* plac'd at an equal Distance. If such a Plant should have an *undivided Leaf* too, whither could it go, or with which should it be join'd? In a word, such a needless Multiplication of the *Species* as this would bring *Botany* under great Inconveniencies, and be of no use to the *Tyrones Artis*. I shall not vindicate that *Chap. of the Umbellæ impropiè dictæ* in *Morison*; but he did not that
through

through Ignorance, since he calls such Plants *Umbelliferae improprie*. Nor do I think the *Valeriana* comes more properly in among the *Flores Aggregati* by Mr. Bobart, for the *Institutors* of that *Genus* never meant *separate Flowers*, upon distinct *Pedicles* should be brought into *Affinity* with them. *Dillenius* observes, that the *Valeriana Palustris Minor*, has Male and Female Flowers, his Words are:

“ There is a Difference among the Flowers of
 “ this *Valerian*, for some are Seminiferous,
 “ more compactly united, like the Heads of
 “ *Scabiosa*; other Plants of the same Spe-
 “ cies have their Flowers more loosely di-
 “ spos'd, so that throughout the whole Plant
 “ the *Stamina* and *Apices* differ'd from the
 “ *Styli* and Seeds. Those *Flowers* which
 “ have the *Stamina* and *Apices* are larger,
 “ and these which have the *Embryones* are
 “ less ^a. I remember, that when I went a
 Herborising towards *Woolwich*, in Company
 with that accurate and expert *Botanist* Mr.
Rand, we saw both, the *Valeriana Palustris*
minor floribus compactis, and *laxioribus*,
 which then seem'd to us to be two distinct
 Species, because we had no Suspicion that there

^a Valerianæ hujus diversi sunt: alii enim seminiferis qui magis congesti & in capitulum scabiosæ æmulum compacti: alii in aliis plantis laxiores & steriles sunt ita ut stamina & apices à stylis & seminibus tota planta removeantur: ii flores qui stamina & apices obtinent majores sunt, embryo autem donati minores. Dillen. p. 47.

would be *Male* and *Female-Flowers* in any Plant belonging to that *Genus*. The *Segments* of *Flowers* were indeed larger in one of the *Species* than in the other, but whether equal or unequal, I have forgot ; they indeed did grow near to one another where-ever they were found, but whether *ab eodem semine satæ*, I shall not determine, but shall leave it to the further Enquiry of those who may Herborise in that Wood hereafter, being resolv'd to advance nothing for a Truth but what consists with my proper Knowledge and Experience: It's a pretty low Plant about one Foot high, with a strait Stalk, but little branched with the *Folia Pinnata*, proceeding from the Stalk by Pairs, having the *Flowers Umbellatim Dispositi* on the top. I shall not much debate whether it be *Gymno. monospermus* or *Enangio-monospermus* : Let them judge of that who shall examine it, according as they shall please to accept of naked Seeds in a more or less *strict* Sense ; but I am ready to join in with *Knaut*, who says, *Capsulam habet striatam in quâ semen oblongum acuminatum cortice proprio involutum continetur. Mirabilis Peruviana sive Fallapa* is the next, and well deserves to be term'd a *Flos Monopetalus Uniformis* : though I am ready to look upon it as a distinct *Genus*, yet by its *Flower* it comes very near to that of a *Convolvulus* ; and though *Heucherus*, as cited by our Author, will not have it to be a *Convolvulus* ; *quia nec tactescit nec convolvit*

convolvit (I suppose he means *Campanula* also by the first) but a Species of *Mirabilis*, because it purges pretty smartly: Yet Dr. *Herman* would rather chuse to have it a *Convolvulus* upon that account, for he says that most of the *Convolvuli* Species, such as *Scammonia*, *Mechoacanna*, *Jallapa*, are all of them Purgatives. Now since I am very well satisfy'd that the *Jallapa* is a Species of the *Mirabilis Peruviana*, as 'tis not only found to be so, by the accurate *Father Plumier* who first found it out, but also by the Grain, Colour (when cut transversely) and Taste of the Root, it appears to be so, yet it would have been no less purgative, had it been a *Convolvulus*, as Dr. *Herman* asserts, who I believe when he wrote his *Hortus Lugduno Batavus*, knew nothing to the contrary; neither is there any great Odds in the Flower; but the *Mirabilis Peruviana* having an *Enangio-Monospermos* Seed, makes the Difference, for all the genuine *Convolvuli* are Tricapsular.

He's so very earnest to have these esteem'd by all other Authors, as only the *Foliola Perianthii*, look'd upon as *Petala*, that he brings *Knawil*, *Beta*, *Blitum*, &c. among the *petalous Flowers*, which was never done by any before him; that he will have them to be *Enangiospermæ*, though he cannot procure the Seeds to be *Capsular*, any otherwise than either before they are ripe to turn them out of their proper Membrane, or by blanching them,

as it is call'd, among warm Water, as if an Almond were *Enangiospermus* too, because the Heat of the Water obliges it to throw its Coat. I shall not say much for the *Beta*, because there are sometimes two or three of them together, and they may be look'd upon as *Capsular*; but for *Parietaria*, I shall never think it has another *Capsula* than the *Calix* or *Perianthium*; nor can *Beta* be allow'd to have any other than an apetalous Flower. He tells us, that *Rhabarbarum male pro Specie Lappathi habetur*. Now if three of these six Segments do not become the *Seminis Capsula*, and the other three do not become its base, then it is not a *Lappathum*; but if the contrary be the Fact, then neither *Tournefort* nor *Knaut's* Interest, can shew any other than that it's a *Lappathum*, considering how far they agree otherwise in the *Facies Externa* and *Plantæ Habitus*. He brings in the Trees too among the Herbs, and makes them to have *monopetalous Flowers*. This is so far out of the common Road, that if every one would give himself such a Latitude, *Botany* would depend upon the *Caprice* of every Fancy, so that the searching after Fact would be neglected, and *Botanick Authors* would be rather depended upon, than the *Dictates* of *Nature*. Dr. *Knaut* has learn'd this Indifference concerning the *Distinction* between *Herbs* and *Trees* from *Rivini*, which was the Ground-Work of those two differatory

O 2

Letters

Letters betwixt Mr. *Ray* and him ; and altho' no regard were to be had to the *Herbaceous* and *Ligneous* Texture of the Plants ; yet Mr. *Ray's* momentous Argument, That all *Trees* are *Gemmiparous*, which *Herbs* are not, might have been sufficient for to have mov'd Dr. *Knaut* to let the *Celebrated Rivini's* Distinction fall. 'Tis true, that several of the *Suf-frutices* are *Gemmiparæ*, which I have remark'd elsewhere ; but Mr. *Ray* answers that Objection very handsomely, That after they have become *Ligneous*, or *Fructescent*, they may have *Gemmæ*, but he denies, and justly too, that any annual Shoot, especially of the first Year (for then they are always herbaceous) have any *Gemmæ*, so that its mere *Humour*, and to be *juratus in verba Magistri*, that can oblige him to make no Distinction between *Herbs* and *Trees*, even tho' they should agree in all their Charactericks ; nor can his making *Ulmus* have a petalous *Flower*, be otherwise than to affect a Singularity.

He makes a great work with the *Characteres Plantarum*, and is angry with Mr. *Ray*, Dr. *Herman*, &c. for establishing a new Class of *Asperifoliæ*: 'Tis an old Class, and us'd before *Classing* by the *Flower* and *Fruit* was thought on ; and now, since the *Flower* and *Fruit* do conspire with the *Folia Aspera* and *Alternata*, I see no Reason why they should be dis-join'd, because of a *circumstantial Equality*, or *Inequality* of the *Segments* ;
therefore

therefore I think *Echium* should come equally in here with *Borrago*, *Consolida*, &c. Every one who knows both, must needs look upon *Symphytum Maculosum*, or *Pulmonaria*, to be a distinct Genus from *Consolida* or *Symphytum Maj.* but *verba valent usu*, as in the *Centaurium maj.* and *minus*; for the *Pharmacians* have four *Consolida*'s, by which they would import the Virtues, not the *Botanical Genera*, v. g. *Consolida maj.* i. e. *Symphytum maj.* which is *Asperifolia*, *Consolida Sarasenica*, *Solidago Saracenica*, which is a *Jacobæa*; *Consolida media*, i. e. *Bugula*, which is an *unilabiate* Plant. *Consolida minima*, i. e. *Bellis minor*; so that it's better to retain the old Names, and to name the Plants in their different Respects, than by giving them new Names to make them be misunderstood.

As to what he says concerning the *Seeds* of the *Omphaloides* and *Cynoglossum* to be *Capsular*, and that all the other *Asperifoliæ* are so too; I know not how to deal with him, who if he cannot find out the *Capsula* of a *Seed* any other way, will do it by warm Water; but otherwise the *Cynoglossum* is more *Capsular* at the first View than any of the others, which may be look'd upon as *Gymnospermæ* in respect of it; and this made me (before I knew Dr. *Plucknet* had done it) class the Plant commonly called *Echium Marinum*, with the *Cynoglossum*, though *Tournefort* brings it in with *Buglossum*, for it has a *Cynoglossum*, but

blue Flower, and four Capsular Seeds, so large that the Calix is scarce able to contain them when they are ripe. It's a low Plant, lying upon the Ground, of a bluish Leaf like unto Coleworts, which made some People mistake it so far, that they boild and eat it for Coleworts in Time of Famine, when the Virtues of the Cynoglossum exerted themselves so far as to make some People sleep to Death, and others that were stronger did not awake till after a long Time. See my Miscellaneous Observations.

He will needs have *Malva*, *Alcæa*, *Althæa*, and *Malva Arborea* to be the same Genus, and says, Tournefort, Ray, Prestone, have err'd, because they make them distinct Genera upon the account of their Calix or Perianthium. With his leave I think the Calix (let him reject it from being the part of a Flower, as he has a mind) is as good a Generical Note as the Equality and Inequality of the Segments, and therefore do fully go into Dr. Prestone's Sentiments concerning the Sufficiency of the Perianthium for constituting three Genera of the other *malvaceous Plants*; and if it were not for the regard had to the Perianthium, they might make up five. The *Malva* has three outer and five inner *Foliola* of the Perianthium, which but half cover the Capsule, *Stylum rotatim Cingentes*, and therefore each of the Capsule, are as it were duntail'd (as the Carpenters call it) or indented with

with the *Stylus Medius*, to preserve the Fruit from falling off till it is ripe. The same is observable in the *Malva Arborea*, with this Distinction, that the outer *Foliola* of the *Malva Arborea* are large and round, whereas the other are less and pointed. The *Malva Arborea* is also *Pentacapsular*, which might constitute a new *Genus* were the Number of the *Capsulae* sufficient to determine it here; and the *Malva* is *Multicapsular*. *Althæa* and *Malva Rosea* have a double *Perianthium*, which close surround and cover the *Fruit* at the top; add likewise, that the *Capsulae* of these two are more flat, and all the other rounder; so that though the *Althæa* has but a small *Flower*, and *Malva Rosea* a very large one, yet since they agree in the *Perianthium*, *Fruit*, and *toto Plantæ Habitu*, I should not have grudg'd to have look'd upon them as one and the same *Genus*, if a long and continued Use had not forbid to alter their Names. *Alcæa* makes a very distinct *Genus*, by its single *Bladder Perianthium*; for the *external Foliola*, are very small and pointed. *Dillenius* very justly observes, that the *Tubus Pyramidalis* in the *Alcæa*, is always inclin'd to one Side, and therefore in *Rivini's* Sense, it may be plac'd among the *irregular Flowers*. *Malaoides*, *Abutilon*, *Ketmia*, *Xilon*, are very justly plac'd next to the *Malvaceous Genera* in one Section, because although they differ in the *Fruit*, the *Malvacea* being *rotatim Circumacti*,

cumacti, and the other for the most part in *Capitulum congesti*; and therefore I know not why *Knaut* should have remov'd the *Ketmia* to such a Distance, and given the Name of *Althæa*, to confound it with another Plant which has so long pass'd under that Name.

I know not why he should have plac'd *Rubia* betwixt *Phyllyræa* and *Jasminum*, I'm sensible it has a different *Fruit* from the other *Stellatæ*, i. e. it has a soft Berry, but it is still the same, as to the Number of two Seeds. Sometimes Dr. *Knaut* will not admit of the *Perianthium*, *Disposition* of the *Flower*, &c. as *generical Notes*, and at other Times he is angry with those who do otherwise. Thus he blames *Tournefort* for joining *Asperula* with *Aparine*, *Nummularia*, with *Lysimachia Lutea*, &c. I have observ'd this before, and think it was amiss in *Tournefort* to do so, because I'm of Opinion that the *Disposition* of the *Flower*, *Leaf*, and other Parts of the *Plantæ Habitus*, ought to be specially regarded in a great many Cases; but for Dr. *Knaut* to do so, is to depart from his own Principle, which is to have a special regard to the *Fashion* of the *Flower* only. He has the same Observation with *Dillenius* concerning the *Rubia parvo flore*, viz. That *vascula habet exigua oblonga, in summo digitata, singulis floribus succedentia gemina, in quibus singulis semen continetur fulvum, alterâ parte gibbum, alterâ verò planum*; and for this Observation

vation he cites no less than three celebrated Authors, *Bauhinus*, *Morison*, *Ray*. So that if *Dillenius* had been to make a Present of the Name to so *Eminent* a *Botanist* as Dr. *Sherard*, he should have made it of a *Non-descript*, and not of a Plant which has been so nicely described by so many before him. And for the *Nummularia*, and *Anagallis Lutea*, they should at least have been plac'd next to the *Lysimachia*, and no such Plants should have interven'd, as *Samolus* and *Soldanella*) for they agree very much with the *Lysimachia* both in *Flower* and *Fruit*. Dr. *Sherard* has observ'd two Species of the *Lysimachia Lutea*, the one whose Flowers are more *disper-sed ad Foliorum alas*, and the other more compact *in Caulis Cacumine*. I have already taken notice of the Relation betwixt *Gentiana* and *Centaurium minus*. There should still be some Resemblance in a Plant beside the noted *Characters* to invite to a Proximity in Distribution, and therefore *Gentiana* comes but ill in betwixt *Trifolium Palustre*, and *Viola aquat. Caule nudo*. *Mandragora*, is not so near of Kin to *Lilium Convallium*, as our Author would have them. *Cerintbe* should not come near to *Centaur. min.* nor *Belladonna* to *Ligustrum*. *Convolvulus* should have had *Quamoclit* for a Neighbour, notwithstanding what may be alledg'd to the contrary. If the Equality of the Segments are always to take place, then several Species of
Plants

Plants must be dis-join'd from their *Congeners*, v. g. *Gladiolus Lacustris Dortmanni*, has a tubulous Flower, divided into five unequal, i. e. two erect or upper, and three lower Segments, notwithstanding which it corresponds with the *Campanula Pratenfis minor*, exactly in the Fructification (as I have observ'd in my *Miscellanies*): Which because it is esteem'd a genuine *Campanula* by *Tournefort*, I likewise entitled the *Gladiolus Lacustris* so too; but since Dr. *Morison* is pleas'd to Class that *Campanula minor* among the *Rapunculi*; and since 'tis Dr. *Sherrard's* Opinion this *Gladiolus* is a *Rapunculus* too, I would yield it, and still look upon both to be different Species, yet to be near of Kin, if not of the same Genus, notwithstanding the Equality and Inequality of the Segments. Our Author it seems, do's not look upon *Campanula* as worthy of a Place among his *Genera*, at least he makes the Distinction betwixt it and the *Rapunculus* to be but small, since according to him they only differ in the more deep or more superficial Division of the Segments. *Crocus*, *Narcissus*, and *Colchicum*, by their *Root* and *Facies Externa*, should have been brought into the Neighbourhood of the *Lillies* and *Irides*, as *Tournefort* has done. And for the *Aloes*, it do's not always properly belong to this Place, for there are several Species whose Flowers have unequal Segments. There was

no necessity for interposing the *Pomifera Scandentes*, such as *Cucurbita* and *Cucumis* (to which *Bryonia* ought to have been join'd, rather than to *Mandragora*) betwixt the *Aloes* and *Ficoides*, which agree in the *Facies Externa*, though not in the Flower; for though I have for some time been of the Opinion, that the *Ficoides* has the Flower of an *Aster*, and I find several others have been of the same Mind too; yet upon examining the Flowers themselves, I am now undeceiv'd. Our Author is in the right when he says it has a monopetalous Flower; and since I find there have been several Mistakes about it, I shall give a more particular Description of it. *Tournefort* seems to have observ'd it pretty well when he says, "That it has a *Flos Monopetalus Companiformis* (according to his manner of Classing the Flowers) divided into several minute or narrow Portions, perforated in the bottom, by which it is articulated with the *Pistillum*; when the Flower is decay'd both *Pistillum*, and *Calix* become a *Multicapsular* Fruit". This is pretty near to what I have observ'd, viz. *That it has a monopetalous Flower, deeply divided into many small, narrow, flat, or*

* *Ficoides* c'est un genre de plante dont les Fleurs sont des cloches evasees, de coupee ordinairement fort menu & precedans le fond ou elles s'articulent avec l'epistle, lors que les fleurs sont passés, le stile & le calice devieunent tous les deux en semble un fruit divise en plusieurs logis rempli des semences. Tourn. dans les Memoires de l'Academie Royal des Sciences, pour L'an 1705. p. 313.

plain Portions, or Segments dispos'd in a Circle, not unlike the Flower of an Hieraceum or Dens Leonis, and some of them so small as the Lactuca, or some of the small Starwort Flowers. All these Segments being conjoin'd in the Center, frame a hollow Tube, more or less superficial, like to that of the Malva, in which the upper part of the Pistillum is lodg'd, from whence arise a great many small, short Stamina, with their Apices more or less elevated in the middle of the Flower. Sometimes the Segments are so very small as the Stamina themselves, from whom they can scarce be distinguish'd but by their Situation and Apices. The Flower is plac'd upon the top of an enlarg'd Calix, which when the Flower begins to decay, has some Resemblance to a Fig, which induc'd Dr. Herman to give it the Name of Ficoides. The Calix has usually five, thick, succulent Leaves of the Perianthium, which surround the Flower before it is blown. The Fruit is for the most part Pentacapsular, as I have been inform'd by that accurate, expert, and ingenuous Botanist Mr. Rand, but sometimes Multicapsular. It is called *Kali Africanum* by Ammannus, or rather *Kali Floridum Aizoides*^a, *Chrysanthemum Plucknet*: *Chrysanthemum Aizoides Bryen.* est *Planta Multicapsularis, Polyspermos, Pachyphyllus*

^a Ammann. Charact. Plant. p. 438,

floribus discoidibus radiatis, Bobart^a. It is not many Years since this Plant was first brought into *Europe*, but it has since multiply'd into a great many Species; though the distinctive Notes are not yet fully establish'd, they make up a large Share of the succulent Plants. The *Ingenious* Mr. Bradly, as I have observ'd, has accurately delineated several of them, and places them among the *Chrysanthema*. Their Number has now so far encreas'd, that the ingenuous and most expert Gardiner Mr. Fairchild has alone in his Garden at *Hoxden*, thirty six several Species, with as many *Aloes*, beside succulent *Tithymals* and *Asphodels*, which is more than has been hitherto seen in any private Garden in *Great-Britain*.

Oxys S. Trifol. Acetos. comes odly in betwixt the foregoing *Ficoides* and the *Ketmia*, which, as is observ'd, belongs to the *malvaceous* Tribe, but he has separated them after the Example of the *Flora Batava*. *Asarum* is the last save one of this Section, though our Author has but small Reason to bring it in among the petalous Flowers, but of this already.

Our Author, *Sect. 2.* which he entitles *De Plantis Flore Monopetalo Difformi*, will not admit of the *Irreglarity* of the *Perianthium*, the *Stylus* not occupying the middle of the

^a Hist. Oxon. Part. 3. p. 506.

Flower, nor the difference betwixt the Number of the *Stamina* and that of the *Lacinia*, or *Segments* to infer an *Irregularity* or *Deformity*, because he do's not look upon them as essential Parts of the *Flower*. So that the Deformity only depends upon the *Petalon*; and he puts the Question, whether this *Irregularity* depends upon the Border or long Tube of the Flower? And some he says will have it to proceed from the middle or *Ungues* of the Flower; but since there are several *Flowers* which in the bottom and middle part are incurvated and gibbous, notwithstanding which they are esteem'd as irregular Flowers by *Botanists*; such as *Verbascum*, *Borrago*, *Symphytum*, &c. Therefore they are not to be esteem'd irregular because of a gibbous *Tube*; but the whole Deformity of the *monopetalous Flowers* depends upon the top or *Margine* of the *Petalon*.

According to *Jungius* and Mr. *Ray*, he divides the irregular monopetalous Flowers,
 1. Into *Semifistulares*, as *Aristolochia*. 2. *Corniculati*, or *Calcari Donati*, as *Linaria*.
 3. *Labiati*, which are either *Labio Simplici*, or *Gemino*, otherwise *Unilabiati*, or *Bilabiati*; and he tells how condescending he is in complying with other *Botanick* Authors in this: " But, says he, least I should seem wil-
 " ling to be look'd upon as wiser than all others,
 " I easily allow, that the Distinction made by
 " common Consent of the unilabiate and bi-
 " labiate

“ labiate Flowers be still retain’d, and let every one use his own Judgment *. I have spoke of the *Valeriana Marina* already, which is the first of this Sect. *Dipsacus* and *Globularia* may still be retain’d among the *Flores Flosculosi in Capitulum collecti* of Tournefort or *Aggregati*, along with the *Scabiosa*, notwithstanding all he can alledge to the contrary; for though the *Perianthium* in the *Dipsacus* is not common to all the *Flowers*, yet the *Flosculi* being thick set together, I think is sufficient to make it a *Flos Aggregatus*. He is so nice as to separate *Trifol. prat. alb. & purp.* and *Echium*, the one from the Congener *Trefoils*, and the other from the other *Asperifoliae*, on purpose to shew how exact he is in *Criticism*. He goes on from thence with the *Labiatae Tetraspermæ*. It is not necessary I should insist upon their several Distributions, since they are brought together by the common Consent of other Authors. He challenges Mr. Ray for not observing, that the middle Lip in the *Flower* of the *Salvia* is bifid. I suppose ’tis the lower Lips that he means, but if he would look narrowly, he would find, that the upper Lip of the *Salvia* is *in duo Labia Fissum*. He proceeds to the *Disformes Capsulares*. He’s too nice with the *Hyoscy-*

* Cæterum ne solus plus omnibus sapere velle videar, facile patiar, ut recepta communibus Suffragiis distinctio in unilabiatos & bilabiatos flores retineatur, & suo quilibet sensu abundet. Knaut. Meth. Plant. p. 80.

amus to bring it in among them. *Cymbalaria* is indeed nearer of Kin to the *Antibirrinum minus arvense* than to *Linaria*, but there can be no Relation betwixt *Antibirrinum* and *Veronica* as to the Flower. I do indeed look upon *Digitalis* and *Gratiola* as distinct *Genera*, but they are *Affines* or ally'd to each other ; and I am of the mind *Arum* and *Dracontium* are generically, as well as specifically different, the one being *Cauliferous*, which the other is not ; for the Flower of the *Arum* arises upon a proper Pedicle.

Cl. 2. He treats of the *Monopetali Aggregati*, and these again he subdivides into the *Uniformes* and *Diformes*, both which he subdivides again into the *Papposi* and *Non-papposi*. In this Class he separates several of the *Capitatae*, several of the *Corymbiferae*, and several of the *Flore flosculoso* and *Semiflosculoso* of *Tournefort*, according as he imagines they have equal or unequal *Segments*. He has a third Section, wherein are contain'd those Plants which have both equal and unequal *Segments* together. In this are *Facea*, *Cyanus* ; among the *Flores flosculosi*, *Helenium* ; among the *Semiflosculosi* *Doronicum Flos Solis*, and most of the *Radiati*.

Cl. 3. Is but a short Class of the *Dipetalous* Flowers, whereof we have only one *European Genus* among the *Uniformes*, viz. *Circea*, and a few among the *Diformes*, such as *Fumaria*, *Capicoides*, &c.

Cl.

Cl. 4. Of the *Tripetalous Flowers*: These are but a few also to make up a Class. They are for the most part Water-Plants, whereof the *Plantago Aquat.* and *Sagitta* make the greatest Number. They are reckoned *Ranunculi* by *Tournefort*, but as our Author justly observes, the *Ranunculi* are for the most part *Pentapetalous*, and these are all *Tripetalous*, though they agree pretty much in the Fruit, in so far as they are *Gymno-polyspermæ*. *Plantago Aquat. Major*, has the least Flower of any of its Congeners. *Dillenius's Observation concerning the Male and Female-Flowers in the Sagitta*, whereof hereafter, holds good here too, for I have observ'd, that there are several Stalks which are loaded with Male-Flowers, and several with the Female or fertile ones, but whether from the same Root I am not certain. The Male-Flowers are larger, whiter, the Petala more expanded, and more conspicuous, the Stalks also of a paler Green, and the Husks after the Petala are fallen off, remain empty. The Female Flowers are more reddish, the Petala less, and not so conspicuous, nor so fully expanded, being a little bended inwards, the Stalk darker Green; the Stalks of both are triangular branched towards the top by Intervals, i. e. three Branches always proceeding together from the Stalk, and sometimes having three smaller Pedicles loaded with Flowers in the Intervals, betwixt the three

P

larger

larger Stalks. The Fruit is also triangular, consisting of several naked Seeds in Capitulum Collecta. It, with the Minor, are more properly *Aquitales* than *Aquaticæ*, i. e. their Soil is not so much in the Water as upon the Sides of the Rivers and Ditches, or in most watry Places. The *Minor* has large Flowers, in Proportion to the other: Its *Capitula* are larger, and somewhat spherical, whereas the other is flat at the top, and almost triangular. There are three Species of the *Sagitta Aquat.* here about London, viz. *Sagitta Aquat. Maj. Latifol.* *Sagitta Angustifol.* and *Sagitta omnium minima.* The Observation of the late expert Botanist Mr. Samuel Doody, is very memorable, viz. That the *Gramen Aquat. Bulbiferum*, C. B. P. is the same with the *Sagitta Aquat.* and being lately in Company with the accurate Botanist Mr. Rand, I was by him inform'd, and observ'd that it was so, for we plainly saw in a River, not far from hence, this *Gramen Aquat. Bulbiferum*, having Leaves about a Foot and a half or two Foot long, and about one Inch broad, floating under Water; and as it inclin'd towards the Surface, it sent forth long Pedicles, with oblong Leaves upon the top, about three, four, or five Inches long, and about one and a half or two Inches broad; after which we observ'd a third Series of Pedicles, which as soon as they had arriv'd at the top of the Water, they produc'd the *Sagitta* or Arrow-head-
ed

ed Leaf, some more narrow, and others larger and broader in different Species; amidst these arose a long round Stalk, which as soon as it mounted above the Water, sent forth Flowers dispos'd upon Joints by Intervals, three and three together round the Stalk; the lowermost had but short Pedicles, and being come to the Fruit it was Spherical. Dillenius observes, that the *Sagitta Aquat.* has Male or barren, and Female or fertile Flowers, and that the *Petala* of the Male-Flowers were more extended, and larger than those of the Female, of which I have given the Figure; whether it is so or not I shall not determine, but leave it to farther Examination, only that all the Spikes or floriferous Stalks I procur'd out of the River, I saw the three *Capitula* of Seeds at the first Joint; and those above were the *Petala*, fallen off, and were empty *Calices*. The Flowers, such as he describes the Male-Flowers to be, were upon the top of all; but whether the *Calices* were empty until the Seeds should be fill'd, I am not able to make any Judgment, since I had not the opportunity of seeing the Female-Flowers, so as to be able to make a Distinction. Mr. Petit, sometime Surgeon in the Hospital of Namure, who seems to be an expert, inquisitive Botanist, gives the Figure of a small Water-Plant, which he calls *Ranunculus Palustris fol. Gramineo & subrotundo*. "He says it has a small fibrous Root (and

“ perhaps bulbous too, for the *Sagitta* has a
 “ fibrous Root beside the bulbous part) two
 “ sorts of Leaves, the one plain, six Inches
 “ long, and about two broad. The other Oval
 “ an Inch long and half, and an Inch broad;
 “ these are green, supported by Pedicles one
 “ Foot high. There do also proceed from
 “ the Root some Stalks (*Tiges*) sometimes
 “ one Foot high, branch’d at the upper part,
 “ bearing Flowers like the *Ranunculus He-*
 “ *deraceus Rivulorum se extendens*, so far as
 “ as he remembers. Now by the two diffe-
 “ rent Leaves which by the Figure appear to
 “ to be of the same Shape with those I saw
 “ upon the *Sagitta*; but the small Account
 “ he gives of the Flowers, I take it to have
 “ been a *Sagitta Minima*, See his Descrip-
 tion in the Note at the bottom *.

But

* *Ranunculus palustris, foliis gramineis, & subrotundis.*
 La racine de cette plante est composée de quantité de fibres
 blanches, dont les plus grosses quantité n'ont pas la quatrième
 partie d'une ligne, & les plus longues sont de demi pied.

Cette racine pousse deux sortes de feuilles, les unes sont
 plates, & longues de six pouces plus ou moins, larges de
 deux lignes, & se terminent en pointe, blanches à leur nais-
 sance, mais tout le reste est verd, ces feuilles sont au fond de
 l'eau.

Les autres feuilles sont ovales, les plus grandes sont lon-
 gue d'un pouce, & larges de demi pouce, elles sont vertes,
 portées sur de pedicules longs d'un pied, qui on tout aux
 plus le tiers d'une ligne d'épaisseur. Ils ne sont pas si verds
 que les feuilles qui nagent sur l'eau.

La racine pousse aussi des *Tiges* qui n'ont quelque fois pas
 un pied de hauteur, elles sont branchues dans leur partie su-
 perieure. Les fleurs naissent de ces branches, elles sont as-
 sez

But that which confirms me most in *Dillenius* his Opinion, that there are Male and Female Flowers in the *Sagitta Aquatica*, is the Account *Dr. Tournefort* gives of the *Nymphaea Alba Minima sive Morsus Ranæ*. The least *Water Lilly*, or *Frog bit*. This has a little round, stiff, shining *Nymphaea Leaf*, about one and a half or two Inches diameter upon the top of each *Stalk and Branches*, the *Flowers* proceeding by *Pedicles* from the *Branches*, are tripetalous, white, with several small *Stamina*, and *Apices* in the middle about the same Bigness, with the tripetalous *Flowers* upon the top of the *Stalk* of the *Sagitta Major*. Now I take these I saw to have been only *Male-Flowers*, 1. Because they were such (as is said) as are represented by *Dillenius* under the Name of *Male-Flowers* upon the *Sagitta*. 2. Its *Calix* is said to become the *Fruit*, which it could not do here, because there was no Enlargement of the *Pedicle*, which always happens in fertile *Flowers*, when the *Calix* becomes the *Fruit*. 3. From *Dr. Tournefort's Observation*. Thus *Morsus Ranæ*, says he, “ is “ a Plant which produces two sorts of Flow- “ ers, the one Male and the other Female ;

fez semblables à celles de *Ranunculus Hederaceus rivulorum*, se extendens, atra maculâ notatus, J. B. 3. 782. si je m'en souviens bien, car lorsque j'ay trouvé cette plante nous étés tous sur le point d'être assiégué, je n'ay pû la décrire sur li lieux. Lettres d'un Medicin de l'Hopital, Let. 3. p. 47.

“ both are Rosaceous and Tripetalous. The
 “ *Calix* of the *Female-Flowers* become an
 “ oblong Fruit, for the most part divided in-
 “ to six Loculaments or Pouches full of small
 “ Seeds” *. *Cæſapinus* also says its *Hexa-*
capsular. This Account both confirms *Dil-*
lenius’s Observation concerning the *Sagitta*,
 and mine of the *Plantago Aquat.* as above,
 and shews the *Morsus Ranae* has also Male
 and Female Flowers, with this difference, that
 the Flowers alone are adherent to a proper
 Stalk arising from the Root; and the other
 are *Flores Solitarii è Foliorum alis*. This
Morsus Ranae seldom bears the Fruit, because
 it has a very running Root, therefore I
 cannot determine of the fertile Flower, and
 can only give the Account of the Fruit from
 Dr. *Tournefort*, because I never did see it
 my self.

Next to the *Morsus Ranae* are to succeed
 the following Plants, viz. *Plantago Aquat.*
min. Stellata Raii Meth. emend. p. 78. of
 which he gives the following Notes: *Foliis*
ut ☉ floribus tripetalis cum plantagine a-
quat. minore convenit, siliculis membranaceis

* *Morsus Ranae*, c’est un Genere de plante qui produit
 deux sortes des fleurs: des novees & d’autres qui ne sont
 pas novees les unes & les autres sont en rose composees de
 trois feuilles (ou plutot petal) disposees de tour du meme
 centre le calice de fleurs devient un fruit oblong partage le
 plus souvent en six Logees remplis des sementes assez me-
 nues. *Memoires de l’Academie Royal des Sciences* 1705.
 p. 311.

stellatim dispositis plurimis unicuique flori succedentibus ab eadem differt. “ This
 “ Plant, says he, agrees with the *Plantago*
 “ *Aquat. Minor*, both in the Leaves and
 “ tripetalous Flowers, but by its small Mem-
 “ branous *Pods*, dispos’d Star-like, and suc-
 “ ceeding to each *Flower* it differs from it.”
 Since Mr. Ray gives neither the *Synonyma*
 nor *Locus Natalis* to this, nor does he men-
 tion it in his *Synops. Stirp. Brit.* it must be
 let alone till farther Accounts be given of it,
 only by the Notes it comes in with *Morsus*
Ranæ, both in the Flower and Fructification,
 and with the following.

Juncus Floridus. Tournefort having mistaken
 its Flower, I have thought fit to give the
 following Account of it. Tournefort says,
 that *Plurimis Petalis majoribus & minoribus*
constat; but ’tis plainly a tripetalous Flow-
 er, with a triphyllous Perianthium; for these
 which he calls *Petali Minores*, are truly the
 three Leaves of the Perianthium which cover
 the Petala before they are blown, and after
 Expansion appear in the Interstices of the
 Petala, almost of the same Colour within,
 which was the Ground of the Mistake, but
 greenish without. It has nine Stamina and
 round Apices, with a hexacapsular, membra-
 nous Fruit. I rather join it with the two
 former, because of the Flower and Fruit,
 than make it *Bulbosis Affines* with Mr. Ray,
 when it has a small fibrous Root. For the

Plantæ Facies, it's rather like a Ceba or an Allium; but its Flowers are not in Capitulum Collecti, but Umbellatim Dispositi, by so many distinct Pedicles upon the top of the Stalk.

Cl. 5. Has the Flores Tetrapetali. Among these he brings in Potamogeton, which is an apetalous, Tormentilla which he has no Reason to separate from the Pentaphylla, because of the tetrapetalous Flower, for it often varies into pentapetalous. Thalurum, papaver capitatum, Monophyllum, Corindum, Cornus, Ruta, Syringa, Herba Paris. All these, as they make up but a confus'd Class, when join'd in with the Siliquosæ and Siliculosæ, so several of them swerve from the general Rule, viz. That all the Unicapsulares and Bicapsulares have sex Stamina, v. g. Papaver Capitatum is Unicapsular, according to his own Confession, and yet it has a vast Number of Stamina. I think the Bacciferous Plants should not be join'd in common with the rest, unless in a separate Section. Herba Paris. has its Petala very inconsiderable, for the greatest Appearance of its Flower depends upon the Largeness of the four broad Leaves of the Perianthium which are greenest, for the four Petala are long, narrow and pointed. It has eight Stamina, according to the Observation of that expert Botanist Mr. George Prestone, Brother to the late Celebrated Dr. Charles Prestone, and present Intendant of the Physick Garden at Edinburg.

Sect. 2.

Sect. 2. The *Tetrapetalæ Difformes*, are the *Flores Papyronacei*, or *Plantæ Leguminosæ*. These are class'd together by the general Consent of all Authors, and for the Distribution of them, that depends upon the Fancy of the several Methodisers.

Class 6. The *Pentapetalæ* are very confusedly mix'd together. The *Umbelliferae*, with those that are are not properly so; either his Observation or mine must have fail'd, or *Hydrocotyle* has two Seeds succeeding to each small *pentapetalous Flower*. *Eryngium* is likewise an *umbelliferous Plant* in that respect, both by the Flower, two succeeding Seeds, and Leaf too, as Dr. *Sherard* well observes, notwithstanding Mr. *Ray* will needs *Class* it along with the *Dipsacus*.

Sect. 2. The *Pentapetalæ Difformes*, for the most part contain such as are class'd among the *Polypetalæ Anomalaæ*. *Class 6.* *Hexapetalæ Uniformes*, contains many of *Tournefort's Liliaceous Flowers*, together with *Anemone*, *Pulsatilla*, *Filipendula*, &c. I see no Reason why *Anemone* in this, and *Hepatica*, *Chelidon*, *min. Flos Adonis* in the *polypetalous Class*, should be dis-join'd from their Congener *Ranunculi*.

Sect. 3. *Hexapetalæ Difformes*, are the *Orchades* and their Congeners, such as are *Ophrys*, &c. To which are added *Delphinium* and *Staphisagria*. I suspect some in this *Sect*, will be found *Monopetalous*, divided into six unequal Segments. *Class*

Class 7. The *polypetalous Flowers* has only two remaining, besides *Hepatica*, &c. The *Flos Trollius*, as he calls it *Ranunculus Montanus Aconiti Fol. Flore Globoso*, It is justly said to be a *Pseudo-Helleborus*, as I have observ'd in my *Miscellanies*.

The last Plant, and only *Planta Flore Difformi Polypetalo*, is the *Aquilegia*. It has five *Petala Corniculata & Tubulosa*, and so many *Plana* alternately plac'd; and yet I do not see how this can be call'd a *Planta Difformis*, since all the *tubulous Petala* bear a Proportion to one another both in their Bigness, Figure, and equal Distance from the Center: So do also the *Petala Plana*, and if in either of these they keep in their true Dimensions, have the same Figure in Relation to, and are at the same Distance from each other, and from the Center; I know not how this can be call'd *Flos Difformis*.

Our Author, by this way of doing, has thrown off very near one third of the Vegetables from being Plants; nor could they be well admitted, since he'll receive no other but such as have conspicuous Flowers, therefore the *Frumenta* and *Gramina*, the *Capillares*, the *Musci*, *Algi*, *Fuci*, *Fungi*, *Conservæ*, *Submarinæ*, *Lithophytæ*, &c. are all of them sent a packing, as unworthy to be nam'd. See how great Inconveniencies they must be expos'd to who invent new Methods to distribute the Plants, which will not answer to all their different Textures. Thus

Thus I have finish'd what I had briefly to observe concerning the several Methods into which Plants have been reduc'd, which are as many as was necessary. Indeed, the several Ways of distributing the Plants has had this good effect, that it may lead the impartial *Botanist* sooner into the more intimate Knowledge of the several Parts of the Plants, than perhaps he could have been brought to otherwise; for as every one strove more particularly to observe that part of the Plant by which he resolv'd to class them, than otherwise he would have done; and as their different manner of Distribution made the Authors of them more particularly observe the different Parts of the Plant; so whoever shall be at Pains to observe all the several Methods, they may come thereby to know more easily the several Parts of the Plants. But as Methods are already sufficiently multiply'd, I hope none will hereafter give the World the Trouble of multiplying them any more by the Addition of new ones, but that they'll rather chuse to correct the Deficiency of what is establish'd already; for as we have the Classing by the Fruit begun by the great Dr. *Morison*, improved by the accurate Dr. *Herman*, so I hope that most accurate, expert, and sedulous *Botanist*, the *Learned and Celebrated Dr. Boerhave* shall bring it to such Perfection as will be satisfactory to all who shall hereafter delight in Classing the Plants after such a manner. As
the

the Classing by the Flower was begun by *Rivini*, brought to great Perfection by Dr. *Tournefort*, so I hope the Ingenious Mr. *Jussieu* and Mr. *Vaillant* will not be wanting to advance it yet further, by the Improvements they shall make upon it, in doing of which Mr. *Vaillant* informs us he is already in great Forwardness. And for Mr. *Ray*'s Method, which is not so confin'd as the other two, but takes in any other part of the Plant he thought was most certain and least subject to Variation; though it has been of late very considerably amended by himself, yet the often cited *Dillenius* has promised a further Correction of it, for which he seems to be most capable; not only because he's a most expert *Botanist*, but because he seems to have a particular Delight in that Method beyond any other. And for Dr. *Knaut*'s, though it be a Method compendious enough, and well enough made out of *Rivini* and *Tournefort*'s, neither are there unsuitable Observations in it from others; yet since there's enough already beside it, that may be laid aside, and the other three, which are sufficient for the purpose, may serve *ab omni ævo*, for instructing of the young *Botanist*.



BOTANICK ESSAYS.



ESSAY IV.

Upon the Generation of Plants.



Have hitherto treated of those Things which more particularly belong to the Plants themselves, such as the Structure of their Flowers, the Difference of their Fruit, and the several Methods into which they have been reduc'd by Authors. I am now to discourse of such Things as are common to Plants and Animals, I mean their Generation or Manner of Propagation of the Species, and Nutrition; and as *Theodorus Craanen,*

Craanen, in his *Traëtatus Medicophysicus de Homine*, when he was to treat of the Generation of Animals, expresses it, *Jam Colophonem ponemus problemati omnium problematum difficillimo.*

To treat of the Generation of Animals, is what has been essay'd by a great many, but few have been able to give that satisfactory Account of it which were to be wish'd for; far less have any yet been able to treat of the Generation of Plants so as it ought be; for that which still kept them in the Dark was,
 1. That though there were two different Sexes in Animals, by whose mutual Assistance the Species was propagated, yet there was no such Thing known in Plants. 2. That though it can be now made appear, that *omne Animal producitur ab ovo*, and not *à Putredine*, as most of the Ancients dreamt the Insects were; Yet there still remain those who maintain that these which they call *imperfect Plants*, are the Product of a certain Rotteness in the Earth, as if the infinite Power and Wisdom of Almighty God were not to be equally manifested in the Production of the least Mite, as of the greatest *Whale* or *Elephant*, or of the least *Mushroom* as of the tallest *Cedar*. This Reflection made the Honourable *Robert Boyle* say, *That he admir'd Nature's Watches rather than her Clocks.*

When Almighty God created the World, he so ordered and dispos'd of the *Materies Mundi*,

Mundi, that every thing produc'd from it should continue so long as the World should stand ; not that the same individual Species should always remain, for they were in process of Time to perish, decay, and return to the Earth from whence they came ; but that *omne simile* should produce *suum simile*. Every Species should produce its own Kind to prevent a final Destruction of the Species, or the Necessity of a new Creation, in order to continue the same Species upon the Earth, or in the World. For which end he laid down certain Regulations, by which each Species was to be propagated, preserv'd and supported, till in order or Course of Time they were to be remov'd hence ; for without that, those very Beings which were created at first, must have continued to the final Dissolution of all Things, which Almighty God of his infinite Wisdom did not think fit. But that he might still the more manifest his Omnipotence, he set all the Engines of his Providence to work, by which one Effect was to produce another by the Means of certain Laws or Rules laid down, for the Propagation, Maintenance, and Support of all created Beings. This his Divine Providence is called *Nature*, and these Regulations are called the *Leges Naturæ*, the Laws and Rules of *Nature*, by which every Thing operates in its ordinary Course, and whatever recedes from that, is said to be preternatural, miraculous or monstrous.

Thus

Thus in the third Day the *Earth* was created ; *And God said, Let the Earth bring forth Grass, the Herb yielding Seed, and the Fruit-Tree yielding Fruit after his Kind, whose Seed is in it self upon the Earth^a.* In the fifth Day he created the *Fish* and the *Fowl*, or *Volatiles*, and gave them the Command to be fruitful and multiply ^b. On the sixth he created the *Terrestrial Animals*, such as *Quadrupeds*, *Reptiles* and *Insects*. And last of all, that excellent Fabrick of Man, whom he appointed to be the Lord of, and have the Dominion over all his Fellow Creatures. So God created Man after his own Image, in the Image of God created he him, Male and Female created he them ^c. Before this we have no Account of two different Sexes; and its in the next Chapter that we are told, *That the Lord God said, It is not good that Man should be alone, I will make an Help-meet for him^d.* Now if this Helper had only been granted to Man as a sociable Creature, endow'd with a reasonable Soul, when he had none else to converse with, to comfort and assist him in the ordinary Administration of his Affairs, in the Obedience of God's Commands, to encrease and multiply the Species, and in providing Food and Raiment for him, and those propagated betwixt them, this Necessity of two different Sexes would not have been so

^a Gen. chap. 1. v. 11. ^b V. 22. ^c V. 27. ^d Ch. 2. 18.

obvious, for God Almighty was able to lay down other Rules, and to contrive other Means for the Propagation of the rest of the created Beings. But since all other Species of Animals, as well as Man, have been ordain'd to be propagated by the mutual Concurrence of two different Sexes, that not one of these Sexes is able to do that without the other, and that such a manner of Propagation or Production, is *Mundi Incunabilis Coeva*, as Dr. *Morison* says of the Method of *Plants*: This renders such a Necessity obvious, *viz.* That no *Species* can be propagated without the Coalition of the two different *Materies* or Substances, in order to produce a *Tertium quid*.

I have already said, that *Plants* have a vegetative Life, and that this is common to *Animals* as well as them. That the Propagation or Production of the *Species*, is the effect of the vegetative, not the sensitive Life in *Animals* as well as in *Plants*; and if there be a Necessity of the Concurrence of two different Sexes in *Animals*, at the begetting or generating of the *Species*, the same Necessity must be in the *Plants* too; for as a *Cow*, a *Mare*, a *Hen*, a *Reptile*, an *Insect*, or *Fish*, cannot produce an Animal without the Male, no more can we suppose that a Plant can produce fertile Seed without the Concurrence of the *Male-Plant*, or the *Male Parts* in the Plant. “ For
“ as Mr. *Ray* says, that he will not deny that

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“ Fruit

“ Fruit may be produc’d, and even preserv’d
 “ to Maturity, without the Concurrence of
 “ the *Male Parts* in the Plant ; for though
 “ most *Birds* do not lay Eggs without
 “ Congress with the Male, yet the Hen very
 “ often does it without copulating with the
 “ Cock, but then these Eggs are barren, and
 “ Wind-Eggs ^a. Just so, though a Female-
 “ Plant may produce Seed of it self, yet that
 “ Seed is never fertile, as shall be shewn here-
 “ after”.

Sennertus was so sensible of this, that he
 wanted nothing but a more intimate Knowledge
 of the Structure of the Flowers of *Plants* to go
 into that Opinion, that Plants as well as *Ani-
 mals*, are *Male* and *Female*, or have *Male* and
Female Parts, and that without the Concurrence
 of two different Substances or *Materies* flow-
 ing from both, or proceeding from the Male,
 and resting upon the Female Parts of the *Plant*,
 no *Seed* can be fecundated or rendred fertile.
 He therefore puts the Question thus, *An se-
 men agat in seipsum*, Can a Seed become
 active of it self ? “ If, says he, there were a
 “ Principle in Seed active for its own Con-

^a Nonnullas interim tum arbores, tum herbas, fructum
 proferre & ad maturitatem pervenire absque mare aut mascu-
 lino semine asperso, non negaverim : Nam & in avibus,
 quamvis pleræque absque maris consortio ova nunquam
 pariant ; aliquæ tamen, v. g. Gallinæ absque coitu non raro
 id faciunt, quamvis ova subventania & infœcunda sint. Raii
 Præf. ad Syllogen. stirp. apud Exteros.

“ formation or Generation, then a Seed could
 “ act within it self; but nothing acts within
 “ it self, because if it acted within it self, it
 “ would be both *agens & patiens actu & po-*
 “ *tentiâ respectu ejusdem*, which, says he, is
 “ impossible.” ^a He solves this difficult Pro-
 position thus: “ In all Seeds there are two
 “ different Substances, the one tenuious and
 “ spirituous, the other gross and terrestrious,
 “ or earthy. In the one resides the active
 “ Virtue, in the other is the passive Matter
 “ and Principle. Therefore this active Vir-
 “ tue acts by its spirituous Particles upon the
 “ grosser Part of the Seed, as upon a corpo-
 “ real Substance; upon which Account it is
 “ not one and the same Substance that acts
 “ within it self, but different Substances: Nor
 “ is it with respect to the same active and pas-
 “ sive Principle, but in different Respects,
 “ which is not absurd ^b”. What a Pity is it

^a Si in semine esset principium activum conformationis seu generationis, tunc semen ageret in seipsum: At nihil agit in seipsum; quia si ageret in seipsum esset agens & patiens actu & potentiâ respectu ejusdem, quod est impossibile.

^b In semine esse diversas substantias, unam tenuem & spirituosam, aliam crassam & terrestrem; In illâ residere virtutem activam, hanc esse materiem & principium passivum, & illam virtutem activam ex spirituosâ parte agere in partem feminis crassiorem tanquam in materiem, & hâc ratione unum & idem non agere in seipsum sed in diversum, nec unum & idem habere rationem principii activi respectu ejusdem, sed respectu diversorum, quod non est absurdum. Sennert. Tom. 1. Hypomn. 4. Cap. vii. p. 179. Col. 1. Edit. 1642.

that he had no Notion whence this active Principle might proceed, and from what it might flow; since he has such a lively Idea of the Necessity of it, but that he was ignorant of any such Thing as two Sexes in Plants, is plain from what follows: “^a There are two
 “ Kinds of living Bodies, *Animals* and *Plants*.
 “ In these living Bodies, some have *Sexes*,
 “ and some none. In those which have no
 “ Sexes, the same Seed is sufficient, which is
 “ a Body so elaborated by the Genitor, that
 “ when it is perfected and separated from the
 “ Genitor, it can subsist intire, and with it
 “ the Spirit of the generating Part is trans-
 “ fer’d to the generated; and then the *Tree*
 “ has generated or begot, when it produces

^a Sunt autem viventium genera duo plantæ & animalia; & enim in viventibus sexus, in aliis non est. In iis quibus sexus non est, unum semen sufficit, quod est corpus ita à generante elaboratum, dispositum, ut ubi perfectum est & à generante separatur, integrum subsistere & cum eo anima generantis in generatum transferri posset: Et tum generat Arbor, cum producit semen; semen autem hoc animatum esse patet. Et sanè firmissimè sunt rationes, quibus probatur semen plantarum esse animatum: Et enim i. comparatum est ut à generante separatum & vegetum subsistere possit, quod aliæ partes à plantis avulsæ non faciunt, quæ statim emoriuntur: Deinde quam primum à calore solis, imò etiam ignis, tempore hyberno, in hypocausto fovetur, & idoneam materiem invenit; vel etiam aquam saltem si ea humectet, ut in maltæ ex hordeo confectione pro cerevisiâ coquendâ patet; sese exserere incipit; ac primò radicem protrudit per quem trahit seu recipit alimentum, & corpus plantæ ei simile à quâ decisum est, format. Quæ corporis plantarum formatio non minùs admiranda est, quàm animalium generatio. Ibid. Cap. viii. p. 182. Col. i.

“ the *Seed*, and it is plain that the Seed is
“ animated——and again. And indeed, there
“ are most prevailing Reasons to prove, that
“ the Seeds of Plants are animated; for,
“ 1. It is observ’d, that when separated from
“ the Mother Plant, being fecundated, it can
“ subsist, which other Parts taken from the
“ Plant, cannot do, for they die immediate-
“ ly. 2. How soon it is cherish’d by the
“ Heat of the Sun, or even by the Fire in a
“ Stove, and shall find convenient Matter
“ whereby to subsist; or if it be moisten’d
“ with Water, as in the making of Malt of
“ Barley for the brewing of Ale, it begins to
“ chit; and first of all it pushes the Root,
“ by which it attracts and receives the Nou-
“ rishment, and forms a Body like unto that
“ from whence it was separated, which is no
“ less to be admir’d than the Generation of
“ Animals”. He says farther, “ That there
“ are two Operations in the Seed, which by
“ a most sure and certain Way lead us to the
“ Knowledge of their lurking prolifick Vir-
“ tue (*animæ Latitantis*) The Conception
“ and Vivification of the Seed, and afterwards
“ the Formation of all the Parts necessary for
“ Performance of the Actions of Life; for
“ first, it is manifest, that the Seeds, as well
“ as the Plants, are preserv’d by their own
“ Life (*ab animâ suâ*) and remain proli-
“ fick for sometime, either shorter, as for the
“ space of one or two Years; sometimes
“ longer,

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“ longer, as for several Years, and so long as
 “ it is whole and incorrupted, and is put in a
 “ convenient Place, where it may be sup-
 “ ply'd with a competent Proportion of Heat
 “ and Nourishment, it is ready again to grow
 “ up into a Plant of that same Species from
 “ whence it proceeded ^a. And again, Al-
 “ though the concoctive Faculty doth not en-
 “ liven the Seed, neither doth it receive such
 “ a lively Disposition from the concoctive

^a Sunt autem duæ in semine operationes quæ nos ad Latitantis animæ cognitionem certissimâ viâ deducunt; feminis conceptus, ac vivificatio; & postea partium omnium quæ ad vitæ actiones edendas necessariae sunt efformatio, primò enim quodlibet semen, ut in plantis manifestum est, ab animâ suâ conservatur & aliquamdiu prolificum permanet, aliud breviori, anni scil. biennii, aliud etiam plurium annorum pro specierum diversitate spatium: Et quam diù integrum & incorruptum est, ac locum idoneum præsens alimentum & calorem externum excitantem nactum, in Plantæ suæ speciei crescere aptum natum est. Ibid. Cap. vii. p. 178.

Ideoque & si concoctrix facultas semen non animat, ut nec in aliis partibus à coctrice facultate eam dispositionem accepit ut possit animæ idoneum subjectum esse, anima tamen quæ est in corpore animato ei sese communicat tam in plantis quàm in animalibus, quod postquam à generante separatum est, animæ, quam possidet, & à generante accepit, vi & potentiâ novum individuum constituere potest. Ibid. Cap. ix. p. 187. col. 2.

Dicitur reverà generare arbor vel herba non cùm planta è terrâ crescit, hæc enim non est generatio, sed Plantæ in actu imperfecto constitutæ ad actum perfectum deductio. Ibid. p. 180. col. 1.

Cæterum utitur anima in actione istâ corporis conformatione subinde ac spiritu quæ est in semine, & ut scœcunda femina sint, facit, & quam diù spiritus iste est in seminibus, tamdiu est anima in *οικειώλη*, quam diù enim spiritus iste evanescit, etiam anima in semine perdurare non potest & femina infœcunda fiunt. Ibid. p. 181. col. 1.

“ Faculty,

“ Faculty, yet it can become a fit Subject
 “ for the Spirit (*anima*). This Spirit which
 “ is in the animated Body, communicates it
 “ self to the Seed or Seminal Matter, as well
 “ in Plants as in Animals, after it is separat-
 “ ed from the Mother-Plant; having now
 “ receiv’d it from the Mother-Plant, and this
 “ Seed or Seminal Matter being in Possession
 “ of it, can constitute a new individual Spe-
 “ cies, *vi & potentia*.

He proceeds to give his Thoughts concern-
 ing the Generation, and how this *Anima*, or
 fecundating Spirit acts upon the Seed. “ A

“ Tree or an Herb is not said to be generated
 “ when the Plant grows from the Earth, for
 “ that is not its Generation, but a Deduction
 “ from an imperfect to a more perfect State.

“ The *Anima* displays it self in this Action
 “ or Conformation of the Body, by the Spi-
 “ rit which is in the Seed, for so long as that
 “ remains, the Seeds are fecundated and ren-
 “ dered fertile; but so soon as this *Flatus* (*ut*
 “ *in οικειάωλη*) this Spirit is evaporated, and
 “ has vanish’d, then the (*Anima*) Life can-
 “ not remain, and the Seeds become barren
 “ and infertile.

Thus I hope I have proved, both from the
 Analogy between Plants and Animals, and
 from the Sentiments of the learned *Sennertus*
 (who knew nothing of this modern Opinion
 of the different Sexes of Plants). That 1. As
 the Work of Generation in Animals do’s not

proceed from their animal or sensitive, but from their vegetative Life, which being the same as in Plants, that Operation must be perform'd after the same manner in both. Therefore as there is a Necessity of two different Sexes in Animals, it must be so in Plants too.

2. As passive, seminal Matter in Female Animals cannot be productive or fertile of it self, without it be impregnated, animated, or its Particles be set in Motion, and dilated by the active Principles of the Male, seminal Matter : No more can the Female Seed in Plants be rendred fertile, until it is impregnated by the *Farina Fæcundans* from the Male Parts of the Plants.

I proceed to a third, and no less convincing Argument, *viz.* The Consideration of the Flowers. If they were not assisting to, or if there were not some extraordinary Use for them in the Perfection of the *Seed*, they would not be so often observ'd upon Plants as they are ; but since there is no Fruit or Seed without a previous *Flower* ; since where the one is obvious the other is conspicuous ; and since when the one is scarce to be observ'd by the naked Eye, neither is the other : This implies such a Relation between them, that the one is not to be expected without the other. There may indeed be Flowers upon a Plant, where the Fruit is seldom or never seen (especially in these Northern Climates) such as the *Perwinca*, *Nymphaea alba Minima*, and several others,

others, where the *Plant* exhausts its nutritious Juice in pushing forth of Tendrills, or upon a running Root, that it is so weakned as not to be able to bring the Fruit to Perfection, as has been observ'd: but there is no Fruit or Seed to be seen, unless there has been a Flower sent as a Messenger before it, to give notice of its approach, though not always upon the same Plant, yet it is still upon some other Plant of the same Species: For the Flowers are to be seen upon distinct Plants, different Branches, or different Parts of the Branch, from the Fruit; as in the *Abies*, *Corylus*, *Nux Juglans*, &c. among the *Trees*. *Mercurialis*, *Spinachia*, &c. among the *Herbs*. But the Fruit never appears, or never begins to encrease upon these Plants, until the Flower is spent and gone. Therefore they must serve for another Use than either to be merely ornamental, for if that were their principal Use, they would be always conspicuous (*Colore Insignes*) which they are not for the most part in the apetalous Flowers; and they would never be hid, but always to be seen, which they are not, as in *Asarum*, *Epimedium*, *Hydrocotyle*, where though the Flower be large enough in Proportion to the Fruit, yet it is not to be seen unless the Leaf be turn'd up, and both Flower and Fruit be narrowly searched for. The *Frumenta* and *Gramina* have their stameneous Flowers, yet in some of them the Flower is seldom to be seen unless you
shake

shake the Spike, and then the *Apices* will appear. The *Polypodium*, and other capillary Plants, have *regular Flowers*, which precede the minute *Capsulae*, or Seed-Vessels; but neither of them are conspicuous without a Magnifying-Glass. The Fig would seem to have no Flower but only a Fruit, yet if you shall open a Fig, when it is become pretty big, there are to be seen abundance of Flowers regularly dispos'd, to which succeed small Seeds, which as they are not half so numerous as their Fore-runners the Flowers, it is reasonable to conclude the Fig has Male and Female Flowers as well as other Plants.

From what has been said, it is plain that Flowers are not constantly a Guard to preserve the tender *Embryones* from the Injuries of the Air (which is the second principal Use ascribed to them) for then the Flower must always have been upon the same Pedicle with the Fruit. Since then the Appearance of the Flower is the first step towards the Production of the Seed, whether both be upon the same Pedicle or not, it necessarily follows the one must contribute towards the bringing of the other to Perfection.

The Ancients observing that several Plants did produce *Flowers*, and had no Seed, and that other Plants of the same Species, and sown from the same *Seed*, did produce the *Seed* without a previous Flower, they were ready to call the one Male and the other Female,

male, without any Notion that the one was assisting to the other, for they look'd upon such Flowers to be only barren; and therefore they call'd these which had the Flowers Female, and those which produc'd the Fruit Male Plants. Thus *Mercurialis* is called *Spicata Fœmina*, and *Testiculata Mas*; but now *Mutato nomine de te fabula narratur*. That which produces the *Fruit* must needs be the *Female*, as it is the *Female Animal* which brings forth the *Fœtus*. Therefore the *Mercurialis Testiculata* (as it is called) must needs be the *Fœmina*, as producing the *Seed*, and the *Spicata* must be the *Mas*, whose Flower is assisting to the Perfection of the Seed, as shall be shewn. Where-ever the Plants are annual, these with the Flowers, and such as have the Seed are always near to each other, but where the Root is perennial, and where the Plant is more frequently propagated by the Root than the Seed, the case alters, because there being no need of the Seed to propagate the Plant, there is the less need of the Flower to be nearer to the Plant which produces the Seed. So that we frequently see *Bryonia* and *Lupulus* to grow, and the one to produce the *Berry*, the other the *squamous Fruit*, when the Plants which produce the *Male-Flowers* of the one or the other are at a great Distance; and this is so far from being an Objection against the Necessity of two Sexes in Plants, as well as in Animals;

nimals, that it is an Argument to confirm it; for it shews the wonderful Contrivances in order to preserve the Species, when the ordinary Means of propagating it by the Seed cannot so conveniently be obtain'd.

We see Animals have a progressive Motion, the Male can approach to the Female, as often as is necessary for the Work of Generation, or Production of the Species, and therefore there is no other Means of doing it but by the Copulation of the two Sexes; and when there is any Animal so created, as to be depriv'd of this progressive Motion, then the Organs of both Sexes are observ'd to belong to one and the same Animal, as is to be seen at large in Dr. *Lister's Exercitationes de Limacibus & Cochleis*^a, where he demonstrates that the *Perwinkles* are *Androgyna*. So that the same *Cochlea* partakes both of Male and Female, and that one and the same Animal has the Members for Generation peculiar to both Sexes. Whoever wants to be farther satisfy'd in that, may consult his Treatise on that Subject. This is what Dr. *Grew* also informs us, as shall be shewn hereafter; and I doubt not but it is so in most Shell-Fish,

^a Tertia autem cochleæ nostræ dissectio erit de organis generationi inservientibus. Illud verò in Animo ante omnia tenere oportet has bestiolas *androgynas* esse, adeoque unam eandemque cochleam maris & foeminæ participem esse & membra generationi dicata utriusque sexus in se habere. *Lister Exerc. de Cochl.* p. 143. c. 21. Lond. 1694.

which

which have no progressive Motion, such as *Muscles, Cockles, Limpets, &c.* Here we see the Species cannot be propagated but by the Coalition of somewhat from the Organs of both Sexes. But in Plants it is otherwise, as *Sennertus* observes ^a, which is of great use for Preservation of the Species; for as the Seeds of some Plants are of so delicate a Texture, that without a due Care they are spoilt, and when committed to the Ground, will rot and decay. As they will not chit and spring forth in all Soils, or in every Climate, so if there were not other Means ordain'd for propagating of the Species, it might decay and be quite lost: Therefore it is, that since the *Male-Plant* of the *Lupulus*, and of the *Bryonia*, are not always near to the *Female*, it is so ordain'd that they are propagated by the Root, and so there is no such need of the *Seed* of the *Female-Plants* being impregnated by the Male-Flowers, from another Plant of the same Species, as in the *Cannabis, Mercurialis, Spinachia, &c.* where there is no other Means of propagating them but from the Seed.

These being very evident Proofs of a necessity of two Sexes in Plants as well as in Animals, I shall in the next Place give some Ex-

^b Propterea cum videamus plantas non solum per radices & exiguum salicis, particulam ex radice lupuli & cori abscissam in similem plantam excrevere. ——— *Sennert. Hypom. 4. Cap. viii. p. 182. col. 1.*

periments to confirm this Doctrine in a negative, as I have already done in a positive Way, *i. e.* I shall shew, that when Plants have been depriv'd of their Male-Flowers, or Male Parts in the Flower, they either produc'd no Seed at all, or if they did, they became abortive, dry'd up and dwindled away. Or 3. Though the Seeds did come to Perfection, they were barren and did not produce. And although some who made these Experiments seem to be of Opinion they did not answer Expectation, yet 'tis probable they were mistaken, in not understanding the true Design of such Experiments, nor having due Patience to wait till they should see the Consequence. Therefore I have inserted the Experiments themselves, not only as of moment, but that I may shew how far they who perform'd them have been deficient, in not knowing what to expect, or in not waiting till they should see the Event, and try if they could procure what was to be expected.

Experiment 1. Mr. Geoffroy cut off all the stameneous Tufts of Male-Flowers from the top of the Stalk in the *Mays* or *Turkey Wheat*, so soon as they appear'd, and before the Spike loaded with the *Embryones Seminis* had broke forth *è Foliorum Alis*. Several of these *Embryones*, after they were pretty big, decay'd and dry'd up, but upon other Pedicles, some Grains all along the Spike, swell'd considerably, *Et qui ont parú chargé des germes & par*

par consequence faconds, and which seem'd to be full of the Bud, and were consequently fertile, while all the others miscarried, and there was not one Spike where the whole Seeds did ripen to the full.

This Experiment is a Proof good enough, of the use of the *Male-Flowers* in this Plant; for whatever it be that flows from the *Racemi* of these *Flowers*, it seems it must be conducive not only for the Impregnation of the *Seed*, but also for the Growth and Increase of the *Fruit*. For as we shew hereafter how these Seeds are impregnated, so what we are to insist upon at present is, that what Nourishment is usually furnish'd to the *Embryones* by the Pedicle, appears not to be capable to dilate or expand it self, nor to contribute to the continual supply of nutritious Particles, unless the *Embryones* were animated and enlivened by the Spirit, which should have flow'd from the *Male-Flowers*, so that they ascending from the Body of the Plant, towards the *Embryones*, were so debilitated and weakened before they could arrive at them, that they which otherwise might have serv'd for the Augmentation and Increase of all the *Embryones* upon the Spike, could now do no more than contribute to the ripening of a few; and although Mr. *Geoffroy* might have imagin'd that these few Seeds which came to Perfection were fertile also, because they were *charge des germes*; he could not be assur'd

of

of that, unless he had sown the same Seeds next Season, and try'd whether they would chit or not.

There is an usual Experiment among Gardiners when they buy the Onion or Leek-Seed from those who import them from *Strasburg*, &c. They put a few of the Seeds among Water, mixt with a little Earth in a Pot; and if after a few Days they observe them to begin to spring or send forth the *Folium Seminale*, or Fiber of the Root, then they are capable to judge of the Product; and perhaps not above the third of these Seeds will be fertile, though all of them, without this Tryal, may seem to be productive enough, being equally full, firm, hard and solid; and this Barrenness may either proceed by their being too much expos'd to the Air, being some time or other too much moisten'd, and not carefully dry'd after that, by which either *animam suam amiserunt*, according to *Sennertus's* Opinion, or they had never been impregnated by the Male Parts of the Flower. Now if the Fulness, Solidity, and Firmness of a Seed, is not a sure Sign of Fertility, then Mr. *Geoffroy* might have been mistaken in his Opinion of the Fertility of these *Seeds* in the *Mayer*, since he did not make any trial of it by committing them to Ground.

He might also have been disappointed in his second Experiment of the *Mercurialis Dioscoridis*, where he rais'd some Stalks which
had

had the Fruit, and others which had the stameneous Flowers, he remov'd the floriferous Stalks before the Flowers were blown. The Seeds upon the fructiferous Plants miscarry'd every one, except five or six, which were so full, that he was persuaded they were capable to produce new Plants, and so did *Camerarius* find in the *Cannabis*; but as neither of them tried the Experiment, by sowing the same Seed the second Year, they were not sure but they might have fail'd in their Expectation. 'Tis true, Mr. *Geoffroy* says it's probable the *Farina* had flow'd from the *Mayer* before he was aware, and that the *Farina* of the Flowers might have flow'd from another Place of the Garden*, and so have impregnated the Seeds of the *Mercurialis*; but whether it was so or not, he could never be certain as to the effect of his Experiments, without sowing these Seeds a second Year, as is said.

The curious and inquisitive Mr. *Richard Bradly*, R. S. S. † informs us, that he took twelve Tulips, planted them in a separate Place of the Garden, remote from any other Tulips, and depriv'd them of their *Apices* immediately after they were blown. Not one of them produc'd either Fruit or Seed

* *Memoires del Academie Royal des Sciences pour L'an 1711. p. 194.*

† *New Improvements of Gardening, &c. Pt. I. page 20.*

that Year, though none of the Four hundred which were in a Bed in another Place of the same Garden, fail'd to produce both abundantly. This, from a Person of his Exactness, may be rely'd on, and is very convincing, as being *ex ἀποψία*. He also advises to take off the Male-Flowers from the Cucumbers, and they shall produce no Fruit, and the Katkins from the Walnut, Philbeard, and Hazle-Nuts, and their *Embryones* shall fall so soon as they begin to appear. It is not easy to have the Experiment duly perform'd with the Trees, because the Dust may blow, and be convey'd to the *Embryones* before one is aware. It may be easily try'd with the Tulips. As for the Cucumbers, their Flowers usually blow very soon after the Plant is come to any suitable Bigness, and so frequently in the Season, that they require great Exactness.

If one has a mind to try any such Experiment, take two Pots full of Earth, sow some Spinage-Seeds in each ; place them at a good Distance from each other, and when the Male Plants of the one begin to appear, which is easily discern'd by the Spike, remove them before any of the Flowers are blown in one of the Pots. For the other Pot, let both the Male and Female-Plants grow promiscuously. If the Pot where the Male-Plants have been remov'd, shall contain any Female Plants which produce Seed, let the Seeds be carefully kept separately, both of such Plants where the Male-Plants

Plants were preserv'd, and where they were remov'd, and sow both of them afterwards, so soon as the Season will permit; and you may then see whether the Seeds from both will be fertile or not.

Mr. *Jacob Bobart*, Overseer of the Physick Garden at *Oxford*, about thirty eight Years ago, which was before the Doctrine of the different Sexes of Plants was well understood, Herborising in the Country, observ'd a Plant of the *Lychnis Sylvestris simplex*, whose *Flowers*, though they had *Stamina*, yet there were no *Apices*; and finding this not in one, but in all the Flowers upon the same Plant, this made him imagine it might be a new Species, and therefore he mark'd the Plant, and took care to have it preserv'd till the Seeds were ripe; and he at length procur'd them full hard and firm, and to outward Appearance *Remplis des germe* (as Mr. *Geoffroy* has it). He fail'd not to sow them in his Garden next Season in a proper Place, but there was never a Plant wich sprung up.

I had this Account from the Celebrated Dr. *Sherard*, at whose desire I have inserted it, and both of them being Persons of such Esteem, and so good Credit, I may venture to say it sets the Opinion of the different Sexes of Plants upon another Footing than it is receiv'd by most of our modern Authors; for this imports that it is not the Nourishment of the gross Substance of the Seed it self, which

is hereby meant, nor the Increase of the Seed-Vessel, which is thereby design'd, for as is observ'd, a Hen can lay an Egg without previous Congress with the Cock, and this shall be the same for Colour, Taste, (when new-laid) Smell, Bigness with another Egg which has been cock'd (as they call it) *i. e.* That has been fecundated by the *Materies Seminalis Masculina*; but the Difference appears when both are put under the Hen to be hatch'd, the one shall pullulate or chir, and the other shall become fetid and rot. Its just the same with the Seed of a Plant, it may be augmented, and encrease in its *Moles*, it may become firm, hard and solid, and have all the Tokens of a perfect Ripeness; the Seed-Vessels may be enlarg'd, and the Pulp or *Parenchyma* of the Fruit be augmented; and yet the Particles of the Seed may remain crude, undigested, and incapable to be explicated and dilated, or set in a suitable Motion, whereby to protrude the *Fibrilla* of the Root at the one end, and *Folia Seminalia* at the other, unless it has previously receiv'd some extraneous Matter, or some active Particles from the Male Parts of the Flower, or from the Male-Flower it self; no more than the Point in a Compass can tend towards the North-Pole before the Needle has been touch'd with the Loadstone; and this is that which is call'd the *Animatum semen* by *Sennertus*, when by the Means of the more active Principles from the

the Male-Flowers, the gross Parts, or passive Principles of the Seed, are animated and rendered capable to extricate themselves, and be set in Motion by the Fomes of the Earth, when committed to it. I shall not pretend that the *Folia Seminalia* are not form'd in the Seed, whether it has been fecundated by the *Farina* or not, for the certainty of that depends upon the Inspection, which I recommend to others to make, having no present Opportunity to do it; nor shall I deny but both the *Seed-Vessel*, *Fruit* and *Seed* may encrease and be augmented to the full without it, for that appears to have been in the case of Mr. *Geoffroy's* Experiment; but as we find that only a few Seeds came to a convenient Bigness, it seems the *Farina Fæcundans* is assisting in that too, both by the frequent Abortions in the Seeds of the *Turkey Wheat* without it, and by the frequent Alterations the Female Bodies of Animals undergo, after they are impregnated by the Male, such as a Dilation of the *Uterus*, and increase of its Thickness, proportionable to the Weight of the *Fætus*, the adventitious *Navel-String*, *Chorion*, *Amnios*, *Placenta*, *Cotylidones*, &c. all which are the Consequence of this Impregnation, which is evident, if upon no other Account, by their being *Ejectamenta* after the *Partus*, whereof more hereafter.

To conclude the Necessity of two Sexes of Plants, as well as in Animals, I have

only this familiar Observation to add, That the Fertility or Barrenness of any Tree in the more or less fruitful Seasons, can be known to ignorant and less curious Persons, by the quantity of the *Flowers* which appears in the Spring time, and that not in the Trees alone, where the Flower and the Fruit are upon one and the same Pedicle, but in such Trees also where the Flowers are upon distinct Trees, or separate Places upon the Tree; for by the quantity of the *Katkins* or *Juli* upon the *Walnut*, *Filbeard*, or *Hazle* Trees, 'tis easy to determine whether such and such Trees shall be fertile or barren for the ensuing Season, before any of the *Embryones* begin to break, be push'd forth or appear. I am sensible it may be objected, that the same fruitful or unfruitful Season may produce both equally. So that the one is not the Cause and the other the Effect, but both Effects proceed from the same Cause, *viz.* the seasonableness of the Winter or Spring; but then, if it is a windy Winter, rather than a windy Spring, and that most of the *Juli* are blown off before they either disperse their Dust, or the *Embryones* break forth. If after this there shall be a Scarcity of these Nuts, my Argument will hold good, and if any will be at Pains to observe it, they'll find the Truth of what I assert.

In the first *Essay*, I discours'd of both the *Male* and *Female* Parts of the *Flowers*. I
come

come now to describe their use in this Place. It is not unfit that Flowers in this respect be divided into that of *Male-Flowers*; these were formerly (as is observ'd) reputed barren, and the Plants which produc'd them were also called *Female-Plants*, because having no Notion of any different Sexes in Plants, they called them *Female* upon the account of their Weakness; or if they had any thought of Sexes in them, it was only allusive: Thus in *Mercurialis*, *Cannabis*, *Spinachia*, those Plants which are now called the Females, were by them reputed Male-Plants, because their Seeds resemble the *Testes*, and therefore they were called *Testiculatæ sive Mares*, as is said. The *Lupulus*, because its Flowers resemble those of the *Cannabis Fœmina* (as it was call'd) is also called *Lupulus Fœmina*, whereas both should be called *Mares*. The Ancients were ignorant of those called at present *Hermaphrodite* Flowers, they had no true Notion of the Sexes of Plants, so they could not imagine that the Parts of both Sexes should be in one Flower, upon one and the same Pedicle. *Androgynous* or *Hermaphrodite Animals*, bear the least Proportion in the Animal Kingdom; but the *Hermaphrodites* have the greatest Share in the Vegetable, though they are not so numerous as they have been suppos'd; for upon strict Examination it will be found, that a great many more Plants have distinct Male and Female-Flowers than was formerly believ'd.

liev'd. I have discovered several this Summer, as shall be shewn.

Having thus demonstrated the Necessity of different Sexes in Plants, and that the Female-Seed, though it should ripen to the full, cannot be fertile, unless impregnated by what it receives from the Male Parts of the Flowers, I come next to explain the Organs of Generation in both Sexes. In the *Animal OEconomy*, beside those Vessels destinated for Nutrition, and for the Secretion of the several Juices in the Body; there are these called the *Spermatick Vessels*, or *Vasa Generationi inservientia*. They consist of the *Præparantia*, *Deferentia*, and *Continentia Semen*. The *præparantia in Males* are the Blood-Vessels and the *Testes*, the one convey the Blood, and the other separates the *Semen* from the Blood, and elaborates it. In Plants again there are Vessels which receive the nutritious Particles from the Earth, and convey it to the Extremities of the Plant, whereof some tend directly to the Leaf, and others to the Flower. These which go to the Pedicle of the *Flower*, may properly be called *Spermatick Vessels*, for it is from them that the *Seminal Particles* in *Male*, *Female*, and *Hermaphrodite Flowers* are separated. Therefore the Pedicles of the *Hermaphrodite Flowers* are proportionally grosser than those of either the *Male* or *Female*, they have a double Office, and contribute successively to both. In those
where

where the *Calix* becomes the Fruit, the greatest Supply is furnish'd to it first, and distributed in its cortical Part. Thus we see the Pedicle is so far enlarg'd at first in the Rose, that it is of an equal Bigness with the Bud. After the *Calix* is thus form'd, the next Distribution is to the inner or central Part of the Flower, call'd by Dr. Grew the *Attire*; and where the *Pistillum* becomes the *Fruit*, the *Pistillum* and *Stylus* is form'd at the same Time with the *Stamina* and the *Apices*.

The *Stylus* at the very first, acquires both its due Length and Bigness, for the nutritious Particles ascending in the Center, never stop till the *Stylus* is stretch'd out to its full Length; and in such as are furnish'd with a peculiar *Apex*, that is first form'd; the Neck of the *Stylus* or that part next to it, is the biggest, from thence it gradually decreases in its Grossness, till it comes to the *Pistillum*. This is easily observable by those who will be at Pains to open the Bud of the Lillies, Tulips, &c. before they are half blown, *Essay* 1. p. 31.

The *Stamen* is next furnish'd with an extraordinary Supply of the nutritious Particles before the Flower is blown. These, whether fewer or more, are at the first brought to their proportional Largeness, being round and Juicy, *Essay* 1. p. 24

The *Apex* is the third which receives this extraordinary Supply of Nourishment, for after the *Stylus* is form'd, that it may lean
to

to it after the Vessels of the *Stamen* are extended to their full Length, and so form'd that they can convey such an extraordinary Quantity of Particles as may fill up the Capacity of the *Apex*, it is then more enlarg'd than ever hereafter; for if you shall open the Flower of a Lilly before it is blown, you shall find the *Apex* is fully as long as the *Stamen*, for as the one half of the *Apex* covers the *Stamen* fix'd to its Center, so its other half is so far extended above the *Stamen*, as the *Stamen* remain'd uncover'd below it towards the Pedicle, *Essay* I. p. 26.

The *Petala* are the fourth which receive this extraordinary Supply of Nourishment before the blowing. These upon the reverse are first enlarg'd towards the Pedicle, and are afterwards extended and stretch'd forth in proportion to the Enlargement of the *Attire*; they are all first grosser, and more succulent towards their *Ungues* or Origine, becoming gradually thinner and broader. In the *monopetalous Flowers*, the *Stamina*, for the most part arise from the *Petalon* it self, but in the *polypetalous*, they arise partly from the *Petala*, and partly from the *Calix*; especially if the *Stamen* correspond in Number to the *Petala*, as in the *Hexapetalæ*, or *Polypetalæ Liliaceæ* of *Tournefort*, where every *Stamen* arises opposite to the middle of the *Petalon*, partly from the *Calix*, as is said, *Essay* I. p. 15.

This

This Observation (how and when this more than ordinary Supply of Nourishment is conciliated to the Flowers) easily demonstrates wherein the Analogy of the *Organs* of *Generation* in *Plants* and in *Animals* consists. In *Animals* the *Seminal Matter* is receiv'd by proper Vessels from the same Blood from whence the other Secretions fit for the Preservation of the *Animal OEconomy* proceed; so that the Blood in *Animals* being the same with the *Sap* in *Plants*, and both being convey'd after the same manner throughout the several Bodies, as shall be shewn, it necessarily follows the one as well as the other must have proper *Vessels* for Secretion of the *Seminal Matter*.

Let us consider then that the *Sap*, or *nutritious Juice* ascends in common to the Pedicle of the Flower, as the Blood flows by the *Aorta Descendens*, and that at the *Calix* or bottom of the Flower, some share goes to one part of it, and some to another, as the *Aorta* sends one Branch to the *Spermatick-Vessels*, and the remainder of it goes to perform the other Functions; And as a part of the *Sap* is separated by the Pedicle of the Flower, when the remainder is distributed throughout the remaining Parts of the Plant, so the *Arteria Preparans* goes directly to the *Testes* in the *Male* and *Ovarium* in the *Female*, and in Flowers, some Vessels tend directly to the *Calix* (if it becomes the Fruit) or to the *Perianthium*

rianthium (if there is any) some to the *Petalæ*, some to the *Stamina*, and some to the *Pistillum* or *Uterus*, as *Malpighi* justly calls it; and whereas in the Trunk of the Pedicle, the Vessels conveying the Sap were large, undivided, now when they are to form divers Substances, out of one and the same nutritious Juice, these common Trunks must be divided, and the Capacity of each proper Vessel must be vastly diminished; so that what Liquor is transmitted by them, must be rendred most tenuious and subtile. And as we see how in the wonderful Intricacy, innumerable Circumvolutions, prodigious Length, and unfathomable long tenuious Duct of all the *Tubuli*, the Seminal Matter must pass throughout the *Testes* and *Epididymides*, before it can arrive at the *Vasa Deferentia*, in order to be convey'd to the *Vesiculæ Seminales*; so the Sap, as it passes from the Pedicle, must enter the most tenuious *Tubuli*, where the grosser part cannot be admitted; from thence some must go to the *Petalon* (in monopetalous Flowers) whose tender and delicate Texture is obvious to exceed the Substance of the Pedicle or *Calix*. Here again it must enter a second Time into *Tubuli* finer than these, *viz.* into the *Stamina*, where the *Tubuli* being still finer than those of the Pedicle *Calix*, or *Petalon*, the Particles convey'd by them, must be rendred very subtile, by the frequent Stops or Hindrances, for the grosser Particles to ascend along with

with them, and so they ascend by parallel Ducts to the *Apex*, where this subtile Matter is retain'd, till it be farther elaborated by the Evaporations of the more humid and aqueous Particles, by the Heat of the Sun, and then it becomes a most subtile, fine, impalpable Dust, which is then said to be ripe.

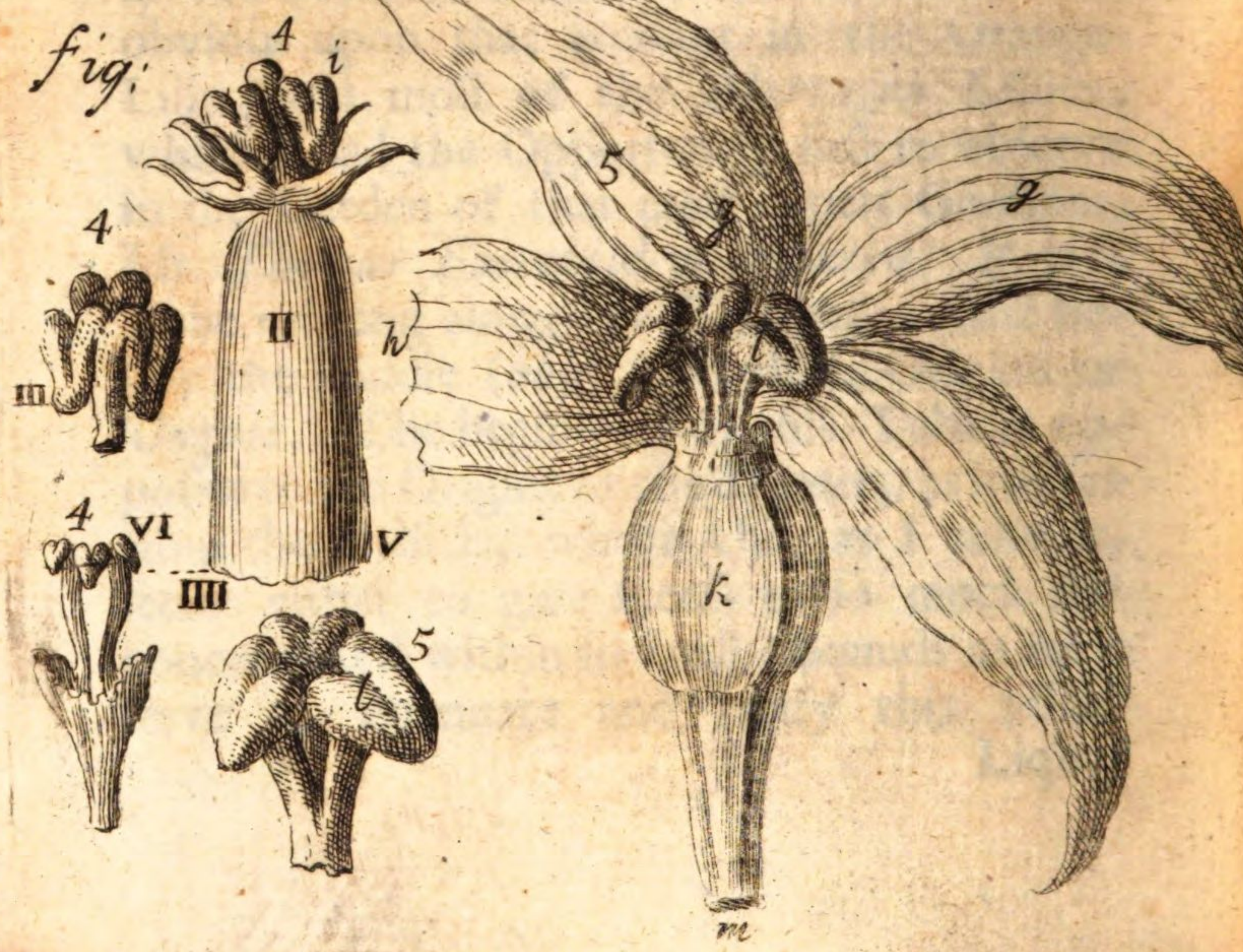
If we shall but seriously reflect on these Things, we must needs conclude, 1. That the same due Care being taken to elaborate and prepare the most subtile and impenetrable Particles of the nutritious Juice in Plants, as of the Blood in Animals: This Substance, 2. so prepar'd, as it must be design'd for some extraordinary Use, so this Use can be no other than that of being the means of fecundating the Female-Seed in Plants, as the other is of the *Ova Fœminea* in Animals. And therefore to make good the Analogy, we shall compare the ascendent Vessels in the principal Trunk and Branches, to the *Aorta*, that Divarication towards the Pedicle, to the *Arteria Spermatica*. Those minute Tubes which convey the Sap from the Pedicle to the *Stamina*, especially if they pass through the *Petalon*, to the *Testes*, because their Capacity is greatly diminish'd, as I have observ'd; and the *Stamina* themselves to the *Vasa Deferentia*, because they convey the Particles thus elaborated to the *Apex*, which I compare to the *Vesiculæ Seminales*, which contains this Seminal Matter thus prepar'd, until it is
farther

farther elaborated, as is said, and until it can be conveniently discharg'd. There is no need of *Vasa Ejaculatoria* here, nor of a *Penis*, because, as in Fish there is no Emission of the one, and for want of a progressive Motion there can be use no for the other, so that *oporet ut Farina avolet in auras*.

But least what I have here asserted should be look'd upon as *gratis dictum*, I desire any one to take a Flower new blown, and pull one of the *Stamina* from the Pedicle or *Petalon*, and there they'll find a tough, viscid Liquor, like to the *Sperma*, which here remains till its more subtile Particles have either ascended the *Stamen*, or perhaps the more gross Particles might have remain'd there after the more subtile had ascended, before the Flower was blown. In the Lillies this is as plain and demonstrable as can be; and there is a Contrivance more obvious upon that account in the Orange-Lilly, and most of the *Martagon* Lillies, which I had the Opportunity first to observe in the Garden of that most expert Gardiner, Mr. *Thomas Fairchild* at *Hoxton*. It is a Tube running along the *Petalon*, a little below the middle (*bbb*) towards its Origine or *Unguis*. The beginning of this Tube is opposite to the Origine of the *Stamen*, as it arises from the Pedicle, whose Use, as I take it, seems either to give access to so much Air concentrated within so small a Bounds as may serve to attenuate and rarify this viscid
Liquor



fig:



Liquor still remaining at the Root of the *Stamen*, thereby to render it more capable to ascend, or for receiving so much Dew or Rain from the Firmament, as diluting its Viscosity at the Root of the *Stamen*, it may thereby the more easily emit its volatile Particles, which penetrating into the *Tubuli* of the *Stamen*, they may from thence ascend to the *Apex*. There seems also to be a third Use, which is to receive and contain the ripe *Farina*, as it falls from the *Apex*, but of that more hereafter. Though I am not positive these are the true Uses of this hollow Tube, yet I am willing to entertain such Thoughts of them until more probable be shewn me. But that the Juice is so viscid in this flat *Flower* is plain; and that this Viscidity is useful in such Cases, is also plain from some other Examples I shall produce, such as, 1. In the Imperial Crown, which always hangs downward, at the Origine of each *Petalon*; and near to the Origine of the *Stamen*, there is a *Pelvis* or *Basin*, which contains this viscid Liquor^a, which though its Mouth is downward, yet the Juice will not exceed its Bounds until the *Petalon* dry up; and I doubt not if it were sooner remov'd, but the Fructification may be hinder'd^b. This Viscidity is yet more obvious in the Pumpions, wherein the *Male-Flower* upon the top of the *Pedicle* (*a*),^c there is a Cavity full of this Li-

^a Tab. i. Fig. 4, 6. ^b Ibid. Fig. 12. (*b*). ^c Tab. ii. Fig. 5.

quor, cover'd by the lower part of the *Pistillum* (*b*), which as an *Alembeck* is plac'd over it, where, by the Heat of the Sun, it is rarify'd, receiv'd into the parallel *Tubuli*, by which it is convey'd to the top, and so makes up the *Materies* of the *Farina*; and least by the too great an Abundance of the Liquor in the Cavity, and too great Heat, it should be pent up and choak'd, there are two Holes (*c c*), for transmitting so much of the Air as is capable to assist the Heat in the Rarification, and further the ascent of this viscid Liquor.

These Examples, I think, are sufficient to demonstrate, that a proper Liquor is separated by peculiar, secretory Ducts or Vessels from the Pedicle, and convey'd to the *Stamina*, where it is rarify'd, and ascends so as to make up the *Materies* of the *Farina* in the *Apex*; and these *Apices* being fill'd before the Flower is blown, it plainly shews that it is necessary there be some *Apparatus* prepar'd for furthering or being assisting to the Fructification after the Flower is blown; for no sooner do the *Petala* expand themselves, and the more humid Particles are evaporated by the heat of the Sun, than the *Apices* themselves immediately burst, and shed the *Farina quaquaversum*. Now if there was no Necessity for the *Farina* in this Case, why such haste to elaborate this viscid Liquor? Why are the *Apices* fill'd before the Flower is blown? And why

why do's it shed the Dust immediately after the Flower is blown? Do's not all this portend that the *Farina* must be of some Extraordinary and special Use towards the Fructification? Therefore I cannot enough admire why so accurate a *Botanist*, and so acute a Wit as Dr. *Tournefort*, who was not only a most exact observer of the Flowers himself, but, to his immortal Praise be it spoken, was the first who set the true Method of observing them on a right Footing; and yet that he should shut his Eyes from so demonstrable a Truth, "and ascribe no other Use to this *Farina*, "than that it was a mere Excrement^a, to "call the *Stamina*, *vasa excretoria*, for the "superfluous Humours (*inepti humoris partibus*) and the *Apices* the Receptacles of "such Particles as were unfit for Nourishment, and that the *Petala* did perfect the "Nourishment, like the Bowels, to the growing Fruit, &c." Whatever is unfit for Nourishment, superfluous or excrementitious, is thrown out or set a-part in the Bowels of animal Bodies after the nutritious Particles are

^a Petala. 1, 2, 3, 4, 5, 6. (Tab. 1. Iconum Tournefort.) alimentum à pediculo acceptum visceris instar perficiunt fructui innascenti, 8, suppeditant inepti humoris partibus per stamina seu vasa excretoria, 9, 10, 11, 12, 13, 14. apices i. receptacula 15. 16, 17, 18, 19, 20. — Diximus jam apices, quicquid minus apti continent, alimentum in se recipere eorumque valvas à congestis alimentis deduci. Tournefort *Isagoge in Rem. Herb.* p. 69, 70.

separated ; but here the Particles are separated and deposited in the *Apex*, as soon, or rather sooner than the Nutrition of the Fruit is begun, 2. Excrementitious Particles are the more gross and terrestrious part of the nutritious Juice, and usually are thrown downwards and descend by their own Gravity ; the Particles on the *Apex*, on the contrary, are the more subtile, volatile, and the first that ascend. And 3. The *Petala* can never supply the Nourishment to the Fruit, because they themselves are supply'd by the proper Vessels, and it's the Pedicle that furnishes it equally to both, as their different Exigencies require, though there were always *Petala* along with the Fruit, and though both Flower and Fruit were always upon the same Stalk, as it's known they are not, and therefore as *Craanen* says of his beloved *des Cartes*, I may say of the great Dr. *Tournefort*.

Quod pace boni viri dictum sit, tamen hic erravit,

Mr. *Vaillant* hugs himself with a great deal of Facetiousness and Delight, when he reflects after what manner the Flower of the *Parietaria* sheds its Dust ; “ So oft as it happens, “ says he, that the Male and Female Parts “ are in the same Flower ; the Extension and “ Swelling of the Masculine Organs is per- “ form'd so suddenly, that the Lobes of the “ *Apex*,

“ *Apex*, yielding to their Force, do expand
“ themselves with a surprizing and wonderful
“ Celerity; at that moment these lustful *Ge-*
“ *nins*’s think of nothing so ardently as to fa-
“ tisfie their Lechery; for they no sooner
“ find themselves at liberty, than they make
“ a brisk and vigorous discharge of the *Fari-*
“ *na*, which carries the Fecundity along with
“ it every where, and by a strange Commo-
“ tion is all at once so weakned, that the mo-
“ ment it obtains Life it procures its Death;
“ Neither does the Scene terminate here;
“ scarce is this Venereal Sport at an end,
“ when the Lips of the Flowers unite and join
“ together, with the same Celerity that they
“ were separated, and recover their former
“ Posture; so that one would scarce imagine
“ they had suffered any Violence, unless they
“ were present to see it; or that there were
“ some Remains to be observ’d, after such
“ violent Transports, which still continue up-
“ on the Field of Battle.

“ All this Mechanism is to be observ’d in
“ the *Parietaria*, if it be view’d in the Morn-
“ ing, when these Parts of the two Sexes do
“ sport and play; but if this fail to be volun-
“ tarily perform’d, touch but one of the *Api-*
“ *ces* with the Point of a Pin, and if arriv’d
“ at a competent Age, you shall see how the
“ *Stamen*, formerly crumbled and wrap’d up,
“ does all of a sudden extend it self, and dis-

“ cover how these amorous Embraces are per-
 “ form'd within *.

* Quoties autem accideret, ut in eâdem stirpe flores gerantur simul, quorum hi foeminina tantum, illi autem masculina & foeminina conjuncta, organa cingunt, arrectio, tumorque organorum masculinorum in hisce tam subito contingit, ut lobuli gemmæ flosculosæ cedant illorum impetui, atque hinc inde semet expandant mirabili meherculè velocitate. Etenim eodem hocce momento libidinosa hæc ingenia nihil ardentius cogitant, nisi ut violentos luxurie affectus expleant, neque citius libera se & expedita experiuntur, quin extemplo quàm vehementissimè foecundam explodant, omnemque uno impetu ejaculentur, genituram, diffusâ nimirum pulverulentâ nubeculâ spargente quaquaversum foecundationem arvi genitalis. Verùm, quàm rara, quàm mira, catastrophe! ipso hoc foecundandi ardore adeò semet exhausta dolent, ut ipso, quo prolem vitâ donant, momento sibi met mortem parant præsentissimam!

Neque vel hîc tamen Scena clauditur. Quid ergo? Vix venereus hic lusus absolutus est, quin ilicò florum labia, aut lobuli, ad se invicem accedant eodem quidem, quo à se mutuò recesserant, celeritatis impetu, veteremque ita formam statim renouent. Ita quidem, ut difficillimum foret credere, flores hosce ullam vim passos esse, nisi vel ipse actum hunc vidisset oculus, vel adhuc cerneret caduca sceleta magnanimorum heroum, qui hanc pugnaverant pugnam; clara quippe hæc gestæ fortiter rei monumenta supersunt aliquamdiu erecta in campo conflictûs, aut Aplustrium instar Jocularios experiuntur lusus volitantis Zephyri.

Apparatum huncce artificiosum facilè spectare datur in pærietariâ. Sed accedas oportet horâ sacrâ Veneri! Aurora est, quæ favet & adspirat diversorum in plantis sexuum voluptatibus, congressibusque; ubi verò agere fortè renuunt satis opportunè ex voto Tui observantis, cogere vel sic poteris, aciculæ apice leniter modò stimules. Si enim matura jam hisce ætas lusibus, opus tantum erit quàm blandissimè unum elevare lobulorum, statimque spectaculo quàm jucundissimo oblectaberis; filamenta quippe, vel manubria staminum ex arcuato hætenus incurvoque flexu in erectum arriguntur situm, ut vi acta violentâ; tumque liquidò spectatur singulare quodque & tectum, quod in exercitio hocce peragitur venereo. Vaillant Sermo de Florum Structurâ. pag. 9.

This I have also observ'd, with much Pleasure, to happen in a Morning to the Mulberry Tree, when the four *Stamina* within each proper *Perianthium* of the *Julus*, being crumbled and wrap'd up like a Scrue, as in the *Parietaria*, are extended and darted forth with inexpressible Velocity, dispersing the Dust every where, which appears like so much Smoke all round the Tree about the time of Sun Rising, or before nine a-Clock, with this Difference, that whereas in the *Parietaria*, after the *Farina* is dispers'd, the *Perianthium*, which now becomes the *Capsula*, is immediately shut, in order to preserve the tender *Embryo Seminis*, and contain it till it be ripe; whereas there being no Seed in the *Perianthium* of the *Morus*, it remains an empty Vessel after the *Farina* is dispers'd; nor is it unpleasant to observe, how every one of the *Globuli* of the *aggregate* Fruit in the *Morus* has two hairy Tufts to stop the *Farina* in its Motion, that it may remain there 'till it has communicated its prolifick Virtue: but of this more hereafter.

As the due Consideration of these things seem sufficient to convince us of the Necessity of two Sexes in Plants; so by what follows, I hope it will more fully appear. Since I have compar'd the *Pistillum* of the *Pompions* to an *Alembick*, it will not be improper to observe, that all the *Seminal Matter* in Plants, whether *Male* or *Female*, does ascend from

the *Pedicle* after the same manner; for as in Distillation, all the more spirituous and subtile Particles ascend first, and then the more gross and aqueous: Therefore these wrapp'd up *Stamina* may not be unfitly compar'd to the *Serpentine*, us'd in rectifying of the Spirit of Wine; for when the Particles of the *Farina* ascend, it is still farther elaborated by the Contortions and Windings in the *Stamen*.

Thus we see how many Convolutions there are in the *Tubuli Seminiferi* in the *Testes*, thro' which the *Semen Masculinum* must pass, before it can be duly elaborated; and as I shall observe, that Plants, Trees especially, have an annual and a perennial Surface, and that how soon this annual Surface, such as the Leaves, the Flowers and the Fruit in the *Autumn* is gone, the Extremities of the *Tubuli*, which convey Nourishment to them, collapse, so that no more Sap can pass that way, which makes the Leaves, &c. dry up, and the Fruit to fall off, as the *Urachus* which arises from the bottom of the Bladder; the Root of the Umbilical Vessels in the Liver and *Ductus Botalli*, or *Foramen Ovale* in the Lungs, collapse and decrease into Ligaments after the *Fœtus* is born, there being then no more use for them. So in this case, as the *Stamina* and *Apices*, after they are empty'd of the *Farina*, decrease, there being no more use for it, so the *Pistillum* or *Calix* do augment; and as the more subtile Parts have already ascended by the *Stamina*, so the more gross

gross Parts remaining, are distributed in a larger Quantity to the Seed-Vessel, in order to form it, and afterwards to nourish the Seed contain'd in it by Means of the proper *Placenta* belonging to each Seed; so that the Seed being made up of the more gross and terrestrious Part, this alone is sufficient to convince how necessary it is there be a more subtile, active Principle, to quicken, enliven, and dispose this gross Substance of the Seed to Fertility, by letting its Particles in such a Motion, as they may be further attenuated, dilated, extended, and be rendred capable to admit of a suitable Supply of nutritious Particles from the Earth, when committed to it; as much as a Hen-Egg has need of the *Ovi* *aer*, as *Bellini* terms it, from the *Cock*, in order to dispose the *Cicatricula* in the Egg to be dilated, the *Lineaments* of the *Chicken* to be form'd, and the *Chicken* it self to be hatch'd.

The Female Parts of the Flower come next to be consider'd; and these are either the *Calix*, when it becomes the Fruit, or the *Stylus* and *Pistillum*, when this last becomes the Fruit. The fertile *Calix*, as I have observ'd, is known by the Enlargement of the Pedicle at the bottom of the Flower, after the *Tubuli nutritivi* have dispers'd the grosser Particles for its formation, while the more subtile were distributed among the *Apices Stamina*, as in the *Rose*. There is a second Secretion, of more tenuious and subtile Particles, from the

grosser *Tubuli*, which nourish'd the *Calix*, to the more subtile, which nourish the Seed; so that, however, the Seed is compos'd of grosser Matter than the *Farina* in the *Apices*, yet its Particles are still more tenuious and subtile than either the *Calix* or *Capsula*. This is obvious to our coarse Taste, as well as by its other Effects, by which the Seeds excell either the Seed-Vessel or Pulp of the Fruit. I'm credibly inform'd, that the pounded Stones of the Raisins at the distilling of Brandy from the fermented Mass, which remain'd after the vinous Juice has been trode out from it in the Fat, yields much more Spirit than when that Mass has been fermented without bruising or pounding of them; and the strongest Cyder is made when special Care has been taken to bruise the Seeds of the Apples at the making of Cyder; and every one is sensible, that the best Cherry-Brandy is made when the Seeds or Kernels have been bruis'd along with the Black-Cherries. This, with the more aromatick Taste in all Seeds of Stone, or pulposus and parenchymatous Fruits, is sufficient to shew that the Seeds are compos'd of more subtile Particles than the Fruit it self, though not so as the *Farina*, by reason of the later Ascent of its Particles, as is said.

I have observ'd, that the *Stylus* receives its extraordinary Growth and Encrease, at the same Time with the *Stamina* and *Apices*, i. e. before the Flower is blown, and from that

that Time it decreases and collapses with them. It is true, so soon as the Flower opens it increases as to its Length, but then it becomes smaller. The Consideration of these Things move me to have another Idea of its Use than I formerly entertain'd, and quite different from those ascrib'd to it by others, of which I shall discourse at more length hereafter. When I reflect on the one hand, that before the Flower is blown, it is still longer than the *Stamina* with their *Apices*, that where-ever there are but few of the *Stamina*, and their *Apices* are at first heavy loaded; the *Stylus*, though shorter, yet it is thicker and stronger, and has for the most part a Button, or proper *Apex* at its Extremity, which being bigger than the *Stylus* it self, becomes a curb to prevent the *Apices* from exceeding in their due Bounds, as to the Length, and serves as a Prop, Stay, or Support, upon which they may lean (*unpivot*) as the *French* say, by which they are kept in their due Situation, and so are preserved from injuring and crushing one another, which by their own Weight they must needs do, were it not for such a Contrivance to prevent that Inconveniency. Whoever will open the Flower of a Lilly before it is blown, shall find the *Apices* in such a Situation round the *Stylus*, as will easily demonstrate this; and it is yet more plain in the *Granadilla* or *Passion-Flower*; for before it is blown, all the fore part of the *Apices* (4.4.4.) lean upon the tripartite

tripartite *Stylus*, which is then erect, divided into three Branches (3.3.3.) each having a Button at the Extremity, to prevent the *Apices* from mounting higher, and to keep them firm in their Posture. No sooner do you remove any of the *Petala* (2.1.1.) before it has begun to open of its own accord, than the three Branches begin to expand themselves with a strong Elasticity, and being separated from each other, acquire a flat, or Horizontal Position, forcing the *Apices* from them, which then agreeably turn round of their own accord; and that Surface which was towards the three *Styli*, and was then the fore-part (so to call it) becomes now its lower part, inclining towards the expanded *Petala*, and dispersing the *Farina* towards their Center and Origine. I was once of the Opinion that the use of the *Stylus* might be to transmit such a Proportion of Air as might serve to inflate the *Capsulae* or Seed-Vessels, wherein the Seeds are lodg'd, because they are usually form'd and empty before the Seeds begin to swell and increase; but when I considered on the other hand, that this requires a hollow *Stylus*, and that there are very few, perceptibly such, I could not think that was its chief Use; for the Use of any part of a Plant or Animal, must be general, and hold in all; which this do's not; for though, as in the *Stamina*, its Fi-

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Tab. III.

p. 266,



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bers may be parallel, yet in most of the *Styli* the Cavity of its *Tubuli* is as little perceptible as that of the Nerves of all Animals. 2. That would invert the Nature of the Thing, as shall be shewn; for its plain that both the Vapours and Juice of Plants ascend; nor can the Juice descend by the same *Tubulus* in the Circulation, no more than our Blood can ascend and return by the same Artery; so that when any Vapour ascends from a Plant, the Wind cannot descend by the same Vessel, I mean in such a Quantity as to inflate or enlarge the Cavity of a Seed-Vessel. The second Use then of the *Stylus*, it's probable, may be to keep the *Pistillum* at its bottom, firm in its Place, least it be distorted by the Load of the *Apices*, and Number of *Stamina* which surround it. Another Example of this may be seen in the *Hypericon*, which being tricapsular, has a tripartite *Stylus*, upon which the *Stamina* leans before the Flower is blown, by which they are kept from crowding and disturbing the tender *Fruētūs Rudimentum*; but when it opens, they tend obliquely outwards, making the *Stamina* incline outwards also. That these two are the true Uses of the *Stylus*, may be farther proved by its decaying much about the same time with the *Stamina* and *Apices*; for when the *Apices* are empty'd, they become lighter, and consequently need nothing to support them, when the grosser Particles ascend in greater Quantity to make up the *Capsula*, so that from an
Embryo

Embryo it now becomes a *Fætus*, and so strong as to be able to exist of it self, without any further Support. The *Stylus* being thus depriv'd of so large Support of Nourishment as it had formerly, by the swelling of the *Pistillum*; and being compos'd of more subtile Matter, alike with the *Stamina* and *Apices*, that evaporating, and no other ascending to supply its Place, it must needs dwindle away and decay of Course.

Having thus describ'd the Organs of Generation in both Sexes of Plants, it may be enquir'd how two inanimate Bodies fix'd to a proper Place, and often at a good Distance from each other, can so unite that the Male must conciliate somewhat to the Female Parts, before the Seed can be impregnated? This Difficulty has been partly solv'd already, and shall be farther clear'd up by what follows. Its proper I should at present give the Origine and Progress of this Doctrine, the Opinion of several Authors concerning it, and add my own Observations, after an exact Examination of several Flowers to confirm the whole.

Dr. *Nehemiah Grew*, some time an Eminent and Learned Fellow of the Royal Society, is acknowledg'd by all to have been the first who discovered the Use of the *Farina* in the *Apices*. He ingenuously owns Sir *Thomas Millington*, *Savilian* Professor at *Oxford*, to have been the first who gave him the Hint of it; for he told him, *That the Attire doth serve*

serve as the Male, for the Generation of the Seed.

In pursuance of this Dr. Grew proposes, That in regard every Plant is ἀρρενοθηλὺς or Male and Female, it serveth for the Separation of some Parts, as well as the Affusion of others. The sum therefore of his Thoughts concerning this matter is, That in the Seed-like Attire, the several Thecæ are like so many little Testicles, and the Globulets, and other small Particles upon the Blade or Penis (the Stamina and Capillamenta) and in the Thecæ (Apices) are as the vegetable Sperm, which so soon as the Penis is exerted (the Stamina are emptied) or the Testiculæ (Apices) come to break, falls down upon the Seed-Case or Womb (Pistillum or Calix) and so touches it with a prolifick Virtue.

And that these Particles only, by falling on the Uterus, should communicate to it, or the Sap therein, a prolifick Virtue, it may seem the more credible, from the manner wherein Coition is made by some Animals; as by many Birds, where there is no intromission but only an Adosculation of the Parts, and so in many Fishes. Neither in others doth the Penis ever enter any further than the Neck of the Womb; nor doth perhaps the Semen it self, or if it doth, it can by no Means be thought bodily, or as to its gross Substance, to enter the Membranes, in which
every

every Conception, or the Liquor intended for it, before any Coition is involv'd, but only some subtle and vivifick Effluvia, to which the visible Body of the Semen is but a vehicle: And the like Effluvia may be very easily affus'd from the above-said Particles into the Seed-Case or Womb of a Plant ^a.

Thus far that ingenious Author, from whose Writings I doubt not but the Celebrated Mr. John Ray has taken the *Innuendo's* to convince him of the same Opinion; for upon all Occasions he insists, " That the *Stamina* and " their *Apices*, are not idle and superfluous " Parts, but most profitable and necessary. In *Synops. Stirp. Brit.* That most valuable Treatise he says, *Hinc etiam confirmatur sententia opinantium pulverem in Apicibus Staminum contentum Spermatidis masculini vicem præstare* ^b. In his *Sylloge Stirpium extra Britannias*, he says, " 1. That God and Na- " ture, or the ordinary Ministers of his Will " to perform his Pleasure, never doth any " thing in vain. 2. The *Flowers* of Plants " may want their ornamental Part, such as " the *Petala*, but they never want the *A-* " *pices* ^c.

His Observation in this is so just, that I can add, as there are several Plants which want some Part or other of the constituent

^a *Anatomy of Plants*, Book iv. Ch. v. p. 172. ^b P. 52. ^c *Prefat.*

Parts of the *Flowers*; but there is no Plant which wants the *Apices*, or some Means to contain the Dust or *Farina* till it is ripe, of which the *Viscum* is a pregnant Instance, where the *Perianthium* and *Petala* are so united, that they cannot be separated without Disruption of the Fibers which pass betwixt them, where is neither *Calix*, *Pistillum*, nor *Stamina*; and where the Dust in minute Globules is spread over the inner Surface of the *Petala*, like a yellowish Powder, not unfitly compar'd to the *Flores Sulphuris* by Dr. *Tournefort*. This Dust, when ripe, becomes blackish, and then the Flower falls off altogether, and is either driven by the Wind, or the Dust is blown from it towards the *Embryones*, which are in separate Branches, or separate Plants of that Species. A most accurate and exact Description of that singular Plant, is shortly to be expected from that *Curious Anatomist*, the *expert* and *sedulous* Dr. *James Dowglass*, R. S. S. Mr. *Ray* continues 3. That all the juliferous Trees produce the Flowers early in the Spring, and the Dust is ripe before the *Embryones* appear.

“ 4. The *Apices* are hollow, and contain the
 “ *Globuli* of the Dust in their Cavity. 5. The
 “ Female *Palma dactylifera* do's not fructify
 “ unless the Male be planted, and the Dust
 “ is sprinkled upon it, when they would have
 “ it become more fertile, otherwise as *Prof-*
 “ *per Alpinus* observes, If the *Aegyptians* fail
 “ to

vid. p. 409

vid. p. 411.

“ to do this, the *Female* Tree either will
 “ produce no *Fruit* at all, or if it did, the
 “ *Fruit* would either abort or miscarry, or
 “ never ripen. He do's not deny but both
 “ Trees and Herbs may produce *Fruit* which
 “ may ripen ; but he compares such *Fruit* or
 “ Seed to a Wind-Egg, as has been observ'd.
 “ From all which he concludes that these
 “ *Apices* are the principal Parts of the Flow-
 “ er, since they contain the Dust, which in
 “ his Opinion is analogous to the Animal-
 “ Masculine Sperm, endow'd with a proli-
 “ fick Virtue, and instrumental in fecundating
 “ the Seed”. Thus far that Learned and In-
 quisitive, natural Historian, who confirms
 what I have advanced concerning Mr. *Bo-*
bart's Experiment of the *Lychnis*, viz.
 That the Seeds may ripen and come to Ma-
 turity, and yet be barren, unless fecundated
 by the *Farina*.

Rodolphus Jacobus Camerarius, Tubingen-
sis Professor, in his *Letter de Sexu Planta-*
rum ^a, is so just to these two *British* Lights,
 that having seriously considered the Opinion of
 the two Sexes of Plants, so often deny'd by
 the Ancients, he acknowledges he was con-
 vinc'd of the Truth, by reading of what Dr.
Grew and Mr. *Ray* had said upon the Subject,
 to whom he attributes the Honour of so valu-
 able a Discovery ; and taking particular No-

tice of what Mr. *Ray* had advanc'd concerning Animals, where he says, " He knows
 " no kind of *Animal* whose *Penis* enters
 " the *Ovarium*, and for the most part it do's
 " not enter the *Uterus* it self; for only a
 " *Halitus* and *subtile Effluvia* are sufficient
 " to fecundate the *Ova*, and to enliven the
 " enclos'd *Embryo*. *Camerarius* concludes,
 " That since all the *Apices* of *Flowers*, what-
 " ever regard they may have to the *Styli*,
 " are so adapted as to disperse the Dust upon
 " them, since Nature evidently demonstrates,
 " that a superficial Touch of the *Uterus* and
 " *Ovum*, is sufficient for *Fecundation*, who
 " can deny that this wandring *Dust* is desti-
 " nated for *fecundating* the *Seeds* in *Plants*.

What Dr. *Grew* and Mr. *Ray* had writ up-
 on this Subject, was neglected, and like to
 be forgot, had not that learned Fellow of the
 Royal Society, Mr. *Samuel Morland*, revi-
 ved it; but he is more positive concerning the
 manner of this *Fecundation*, than *Camerari-
 us*, who though he favours the Notion about
 the *Stylus* being the means of Conveyance very
 much, yet he concludes, as to that, *Non no-
 strum tantas componere Lites*. For Mr. *Mor-
 land* establishes a new and unheard of Opinion
 concerning it. His Words are

" But the admirable Dr. *Grew*, to whose
 " Industry and happy Sagacity we are in-
 " debted for the best Improvement of this
 " part of Knowledge, is the only Author I
 T find,

“ find, who hath observ’d that the *Farina*,
 “ or fine Powder which is at its proper Sea-
 “ son shed out of those *Thecæ* or *Apices Se-*
 “ *miniformes*, which grow at the top of the
 “ *Stamina*, doth some way perform the Of-
 “ fice of the Male Sperm. But herein I think
 “ he falls short, in that he supposes them on-
 “ ly to drop upon the out-side of the *Ute-*
 “ *rus* or *Vasculum Seminale*, and to impreg-
 “ nate the included *Seed* by some spirituous
 “ Emanation, or energetical Impress^a.

Upon which he makes this Query, “ Whe-
 “ ther it be not more proper to suppose, that
 “ the Seeds which come up in their proper
 “ *Involucra*, are at first like unimpregnated
 “ *Ova* of *Animals*”. That this *Farina* is a
 Congeries of *Seminal Plants*, one of which
 MUST be convey’d into every *Ovum* before
 it can become prolifick: That the *Stylus* in
 Mr. Ray’s Language, the upper part of the
Pistillum in Tournefort’s, is a *Tube* design’d
 to convey these *Seminal Plants* into their
 Nest in the *Ova*: That there is so vast a Pro-
 vision made, because of the Odds there are,
 whether one of so many shall ever find its
 way into, and through so narrow a Convey-
 ance.

Mr. Geoffroy, Member of the Royal Aca-
 demy of Sciences at Paris, being instructed by
 the Fellows of the Royal Society; and Ca-

^a *Philosoph. Transact. No. 287. p. 1474.*

merarius, though he neither acknowledges it, nor mentions them, yet sums up their Opinions thus,

“ 1. That the Dust being wholly sulphureous, and full of subtile, penetrating Particles, as is evident by its odoriferous smell, Falls upon the *Pistillum*, where it remains, and that the more subtile Particles penetrate the *Pistillum* and young Fruit, where they excite a Fermentation capable to disengage the young Plant, shut up in the *Embryo* of the *Seed*. For it is believ’d by this Opinion, that the *Embryo* contains the young Plant (which is to spring forth) wrap’d up, and that it wants a proper Juice to disintangle it, and make it grow. This he has from Dr. *Grew*.

“ 2. That the *Farina* is so many first *Germina*, or Buds of the Plant, which have only need of a proper Juice in the *Embryones* to be nourish’d and encreas’d therein, as the Animals have need of an *Egg* or *Uterus*, to hatch and bring them forth. This he says has so much the better Foundation, because there is not the least Appearance of the *Germen* by the finest Microscope in the *Embryo*, before the *Flower* is decay’d, and that the *Apices* have shed the *Dust*; and these are not only unobservable in the *Embryones Seminum*, but they are not to be found in the Seeds themselves upon Examination, after they are

“ pretty well advanc’d, and the Bud become
 “ pretty visible, if it has not been fecunda-
 “ ted by the *Farina*^a.

The Opinion is Mr. *Morland*’s, and the Experiment is *Camerarius*’s, contain’d in his following Paragraph, but too long to be inserted, concerning a Microscopical Observation made upon the Progress and Encrease of the Seed in a leguminous Plant, perform’d by *Camerarius*, and translated Word for Word from the *Latin* into *French*, by Mr. *Geoffroy*. Neither doth it so much confirm this second Opinion; for if all requir’d by it be to shew the Prevalency of the *Farina* for fecundating the Seed, that can be granted by the Favourers of Dr. *Grew*’s as well as Mr. *Morland*’s Opinion; but if by it is meant the Entrance of the *Farina* into the *Embryo*, this Experiment neither shews that, nor proves the Conveyance.

The curious and inquisitive Mr. *Richard Bradley*, R. S. S. was the next who in order of Time has given his Opinion in this Matter, his Words are, in making use of the Lilly for an Example; “ That the Male-Seed of the
 “ Plant is convey’d from the *Stamen* to be per-
 “ fected in the *Apex*, where, by the Sun’s
 “ Heat it ripens, and bursts forth in very mi-
 “ nute Particles, like Dust, some Particles of

^a Memoire del Academie Royal des Sciences pour L’an 1711. p. 297.

“ which Powder falling upon the Orifice of
“ the *Stylus*, is *either* convey'd from thence
“ to the Utricle, *or*, by its magnetick Vir-
“ tue, draws the Nourishment with greater
“ Force from the Parts of the Plant into the
“ *Embryo's* of the Fruit, and makes them
“ swell. *Improvements of Gardening, &c.*
He makes use of Mr. *Morland's* Examples of
the Lilly and *Corona Imperialis*, but finding
the entry of the *Farina* into the *Pistillum*
has some Difficulty, he uses the alternative,
or by its magnetick Virtue, &c.

As I shall enquire into the Validity of these
Examples hereafter, so I beg leave to tell Mr.
Bradly in the interim, that there is no need
of having recourse to Attraction, since the
ordinary Circulation of the Juice of the Plant,
and such a Dilatation of the *Tubuli* which con-
vey it, as is requisite, will do the thing, with-
out *drawing the Nourishment with greater*
Force. Nor do's the magnetick Virtue in the
Bees-Wax confirm the Opinion; for what is
viscous, such as *Rosin, Terebinthina Cocta*,
and harder Bodies, as *Amber*; and a Glass
Tube or *Cylinder*, if rub'd till it is warm, have
that drawing Quality as well as *Bees-Wax*.

The last who I find has treated upon this
Subject, is *Sebastian Vaillant*, a noted *Bo-
tanist*, Demonstrator of the Plants in the Roy-
al Garden at *Paris*. He in a Discourse upon
the tenth of *June 1717*, concerning the *Struc-
ture* and *Difference* of Flowers, being of dif-

ferent Sentiments from the last three, makes the following Supposition.

“ Granting there were such Conduits, and
 “ that it were possible for each Grain of the
 “ Dust to enter the Capacity of the *Ovaries*,
 “ shall we therefore be persuaded, that each
 “ Grain is predestined to enter its proper
 “ *Ovum* before any other : Can they pe-
 “ netrate into so many *Ova*, when the whole
 “ *Ovarium* has but one Cavity ? v. g. In the
 “ *Primula Veris*, where the *Ova* are as it
 “ were indented into the *Placenta*, situated
 “ in the *Ovarium*, much after the same man-
 “ ner as the *Fructus Alkekengi* is in the *Vesi-*
 “ *ca*, or as the Socket which contains the
 “ Candle in a Lanthorn. In that case one of
 “ the two must happen, either the Shell of
 “ the *Ovarium* must be broke, that the *Em-*
 “ *bryo* may get in, or by making a long *Tour*
 “ or *Route*, it must creep in betwixt the Eggs,
 “ penetrate the *Placenta* to pass that way,
 and so enter the *Ova*. Are these Ways natu-
 “ ral, or are they practicable ?

I have now given the Sentiments of seven different Authors upon that Subject, in their own Words, lest it should be said I had wrested the Sense, or misapply'd their Meaning : and being resolv'd to obey the *Motto* of the *Royal Society*, NULLIUS IN VERBA, I shall impartially give my own Sentiments at last, without becoming a Party-Man so far as to subscribe to this or t'other Sentiment, because
 such

such an one has advanced it, but by an exact Examination of the Flowers themselves, shall endeavour to find out which of these two Opinions, so diametrically opposite to each other, are most consonant to matter of Fact.

But before I begin, I must lay down this general Maxim, which I hope none will deny, *viz.* That Nature is uniform in all her Operations, and never recedes from those Rules laid down by the wise Disposer of all Things at the Creation, by performing the same Thing after two different and contrary Methods; therefore, if the *Farina* be a *Congeries* of Seminal Plants in one Species, it must be so in all. If there be an open and direct Passage; or though not so direct, yet if by any indirect Passage, by which it can be demonstrated one single Grain of the *Farina* can enter every individual Seed in one Plant, it must be so in all; but if neither of these hold good; and if it can be prov'd by ocular Inspection, without the Assistance of a Microscope, in those very Plants exemplify'd by Mr. Morland, Mr. Geoffroy, and Mr. Bradley, that the *Farina in Substantia* cannot enter the *Vasculum Seminale*, or if it do, that there is no direct Passage for it to enter each particular Seed, after it has so got into the *Capsula* or *Siliqua*; then I hope both their Queries, Suppositions and Assertions must fall; and if this is plainly demonstrated in Plants, then the late so universally receiv'd

Opinion, that the *Animalcula* in *Semine Masculino*, is that which by its Entry into the *Ovum Fæmineum* becomes the *Fætus*, must fall to the Ground too, because of the *Analogy* I have prov'd to be betwixt Plants and Animals.

Mr. *Morland's* first Example is of the *Corona Imperialis*, whose Flower hangs downwards. I shall not deny but its *Stylus* may be hollow all the Way, and that it may be open at the Extremity also, for I never observ'd it with an intent of examining it narrowly; but by its Situation, and several other Circumstances, it do's not seem to favour this Opinion.

For, 1. As in Animal Bodies there is a continual Efflux of Particles through the Pores of the Skin, it is so in Vegetables also, as appears by the immediate fading of Flowers, or any other part of a Plant after being pluck'd off, which proceeds from the Evaporation of the Particles in the *Tubuli*, without any more succeeding to supply their Place. Now it is as reasonable to suppose that these Particles flow out by the hollow *Stylus* as by any other part, and more sensibly there than elsewhere, because of being concentrated within so narrow Bounds. Now if these Particles descend by the *Stylus*, hanging downward, the Particles, or rather Grains of the *Farina* can never ascend that same Way. 2. Granting that these Grains did ascend by the *Stylus*, how do they get into the *Vasculum Seminale*?

nale? Every one who will but observe it may see that's closely shut up. There is a *Paries intergerinus*, a Partition-Wall betwixt them; for though the *Stylus* is plac'd upon the *Pistillum*, it is seldom or never one continu'd Body with, but a distinct Body join'd to it, 3. Mr. Morland seems to contradict himself, when he supposes the Rain either washes it, or the Wind shakes it down the Tube till it reach the *Vasculum Seminale*. (N. B. He traces it no farther) For that Extremity which is the upper part of the *Stylus* in an erect Flower, must be the lower in a dependent one; so that the Rain or Wind, if either have access to it, must rather wash or drive it away from the *Vasculum Seminale*, which is now above the *Stylus*. I heartily join with him, that the *Pinguid Villi* at the Extremity of the *Stylus*, may be plac'd there to catch and detain the *Farina* as it flies out of the *Thecæ*^a. This is what Mr. Bradly observes, when he says^b, “ We may easily
“ conceive that the glutinous Matter and
“ Velvet Covering on the Extremity of the
“ *Pistils*, may be capable of receiving and
“ holding some of the Powder as it falls;
“ and whether the Immission of the *Farina*
“ *Fæcundans* be requisite or not, its Lodg-
“ ment on the Mouth of the *Pistillum*, may,
“ by virtue of its attractive Quality, per-

^a *Transact.* No. 287. p. 1475. ^b *Improvement of Planting, &c.* p. 19.

“ haps fecundate the Seed contain’d in the U-
 “ *terus*. I go so far in with Mr. *Bradly* in the
 alternative (tho’ denying the attractive Quali-
 ty; for the Levity and natural Propensity of such
 subtile Particles to ascend, is sufficient here)
 that I shall put him in Mind of another Contriv-
 ance for that purpose, of which I doubt not
 he is already sensible, *viz.* of the *Pelvis* (so to
 call it) or Cistern situated at the Root or Ori-
 gine of each *Petalon* (*a*) *Fig. 12. Tab. 1.* fill’d
 with a viscous Liquor (*b*), which continues there,
 and never exceeds its Bounds so long as the
Petalon is in Health; *for since the Apices are*
here so artfully fix’d, that they turn every
Way with the least Wind, as Mr. *Morland*
 justly observes, when they burst, and the *Fa-*
rina is driven to and fro, though it cannot
 so easily enter the narrow Tube, yet it may
 be conveniently blown up towards the Ori-
 gine of the *Petala*, surrounding the *Stylus*,
 where it is stop’d or staid by this Viscosity till
 it has perform’d its Office. Mr. *Fairchild*
 being persuaded that this viscous Liquor did
 some way or other contribute towards the
 fructifying of this Plant, but not being sensi-
 ble how it did it, tried the Experiment of
 wiping it off so soon as it was deposited in
 the *Pelvis*, and the Flower so serv’d did not
 fructify, or had no succeeding Fruit. The
 way I account for that is, the Humidity be-
 ing remov’d, the *Farina* is no sooner blown
 upwards, than it immediately falls down, with-
 out

out furnishing any Effect; and that which confirms this is, because both Tulips and Fritillaries frequently have this *Pelvis* or *Bason*, yet it is for the most part dry and empty, because their Flowers being erect, especially the former, they have no such need of this Liquor to retain the Dust; for the Rain having immediate access to them, may wash the Dust towards the Origine of the *Petala*, where it can remain till it has done its Work: whereas the Rain having no access to the inner Surface of the Flower of the *Corona Imperialis*, it is naturally endow'd with this Humidity deposited there by several excretory Ducts, in order to render it fit for the purpose. See *Malpighi Anatome Plantarum*, dedicated to the *Royal Society*, where he takes notice of this Singularity in this Flower, but ascribes no such use to it.

The *Lillies* are the next Examples propos'd, both by Mr. *Morland* and Mr. *Bradly*. In Mr. *Morland's* Figure of the yellow Lilly, he represents it to have the *Apices* (bbbbbb) to be equally high with the top of the *Stylus* A, and the *Petala* to over-lap each other. I'm sorry his Engraver should have so far impos'd upon the Publick; for by what, upon narrow Inspection, I ever could observe, the top of the *Apices*, before the *Lilly* opens (they being then perpendicularly situated,) reaches no higher than the Neck of the *Button* upon the top of the *Stylus*; and
this

this is before the *Apices* begin to burst and shed the Dust; but no sooner do's the *Flower* begin to open than they depart from the *Stylus*, and by a certain Elasticity force the *Petala* outward, and to expand themselves. This done, they immediately change their Posture from perpendicular, to oblique or horizontal; nor do they ever pour out their Dust until they can conveniently drop it upon the bottom of the *Flower*, and towards the Root of the *Pistillum*.

But granting it were so, the top of the *Stylus* (which I call the *Button*, in Contradistinction to the *Apices Stamina*) (*aaa*)^a *Fig, 1, 2, 3. Tab. 1.* is so compact, and of so firm a Substance, that its next to impossible that the *Farina* in Substance, or in *Partibus integris*, can pass through it. If the *Partes integræ*, the compleat Grain, the *minute Globuli*, in which is contain'd the whole *Seminal Plant*, cannot then enter, the *Totum Compositum*, must be dissolv'd, and the *minute, Seminal Particles* in this small *Grain* of *Dust* must be disunited; and how shall these again come to cement so as to make up one continued Body? Or how shall this *Corpusculum*, so united, penetrate a second Time the Partition-Wall, betwixt the *Stylus* and *Pistillum*? And in the third Place, how shall it find out its way to its Nest in the proper *Embryo*

^a *Transact.* 287. *Fig. 23. p. 1479.*



TAB. I.



Seminis ? Let them answer the Question who can.

The *Lilium Album* has indeed its *Petala*, which over-lap each other, *Fig. 1.* Their inner Surface is so viscous, that the Rain will not wet them, no more than if they had been rub'd over with Oil. Here the *Farina* falls towards the bottom of the *Flower* in great Abundance ; it is most fragrant, and the *Apices* (*bb,i*) are longer than those of any other Lilly. The *Stylus* (*n*) is so far from being adapted to receive the *Farina*, that it is always bended upwards, when the Flower is expanded, and as it were flies from the *Apices*, which by this Time rather incline downward.

The *Petala* of the two Orange-Lillies, *Fig. 2, 3*, are so far from over-lapping each other, that there is a distance betwixt each of them at their Origines (which persuades me that there must be an Error *Typographi*) rather than Design in Mr. Morland's Explication of the Figures, *p. 1479.* and *yellow* must be put there instead of *white*. This Distance betwixt the *Petala* is so great, that if it were not for certain *Villi* or Hairs interspers'd upon their inner Surface, and inclining obliquely upwards, the *Farina* would be in Hazard of being lost (*aaa*) *Fig. 4.* The Absence of these *Villi* in the *white Lilly*, and their being so plentiful upon the other two, denotes some special Use in them more than in the other ; and I can think

think of none more probable than that of retaining the *Farina*, *Fig. 3.* The *Apices* (*c, f, g*) seldom reach much higher than the *Pistillum*, so far is the *Stylus* in it from being adapted to receive the *Farina*. I was one of the first who discover'd this to be a distinct Species. Every one of the *Petala* in both the *Orange Lillies*, have a longitudinal *Tube*, *Fig. 4.* reaching from a little below the middle (*b*) downwards (*c*) to the *Unguis* or *Origine* (*d*) where it arises from the *Pedicle*. We have spoke to its Use already.

The *Martagon Lilly*, *Fig. 5, 6.* hangs downwards. Here the *Apices* are so artfully fixed also, that they may turn every way with the least *Wind*, so that the *Farina* is easily blown upwards, since all the *Petala* are reflex, contrary to what is in the *Imperial Crown*. The bottom of the Flower (so I call it because of its Situation) or the *Origine*, is always cover'd with a *Viscosity*. The *Button* is hard and solid, and has Grains of the *Dust* affix'd to it; not what it receiv'd from the *Apices*, but the result of the Particles which ascend by the *Tubuli* (for before it is blown it is erect) and naturally burst forth from it self; so far is the *Farina* here from being capable to enter the *Stylus*, and ascend to the *Vasculum Seminale*. The *Stylus* is indeed hollow in all the *Lillies*, especially the *Orange* or *yellow ones* (*b*) *Fig. 3.* But as the solid *Button* hinders or stops the entry
to

to the *Farina*, &c. I suppose it to be so to render it the more Light, for if it had been solid of that Largeness, it would have been too heavy, and apt to crush the tender *Pistillum* before it was well form'd; for, as is observ'd, the *Stylus* usually acquires its full Bigness before the *Pistillum* can well support it.

The *Iris* is a most pregnant Instance that the *Farina* cannot so much as come at the *Pistillum*, for having six *Petala*, Fig. 7. the three *Stamina* with long *Apices* lie hid between the three Down-Falls or *Petala*, which hang downwards (III) Fig. 8. and three large Expansions of the bifid *Stylus* (2) Fig. 9. and the upper part of the Down-fall (3). The *Farina* can never reach the Center of the *Stylus* (3) Fig. 8. though it were hollow, which it is not, but must descend along its out-side, to the top and out-side of the *Fruētūs Rudimentum*, there to emit its *Effluvia*.

The *Malva*, Fig. 10, 11. is another pregnant Instance. This has a *Tubus Paramidalis Staminaibus onustus Pistillum excipiens*, as *Tournefort* expresses it. The *Stylus* called *Pistillum* by *Tournefort*, is lodg'd in a *Pyramidal Tube* (ddd) Fig. 10. so fully loaded with *Stamina* and *Apices* as it can hold. All these shed their Dust outwards, which must fall down upon the bottom of the *Flower*, and none of it can enter the Cavity of the *Stylus*; but supposing it did, the *Pistillum*

or

or *Fruētūs Rudimentum* being lodg'd at the bottom of the *Tubus* (*b*) *Fig. 10.* and the *Capsulæ* being adherent to the *Stylus* (*f*), if the Grain of the Dust did fall down to the bottom of the *Stylus*, it must again pierce it perhaps thirty or forty Times in the *Malva Rosea*, opposite to each of the *Embryones Seminis* in the *Fruētūs Rudimentum Stylum rotatim cingens*, of which there's no *Vestigia*.

But there's another Plant with a *Mal-low-Flower*, which has a capsular Fruit, and the same *Tubus* with the *Stamina* and *Apices*, bending outwards, called *Ketmia*, or *Alcæa Arborescens*, *f. B.* which because its *Stylus* (*g*) *Fig. 10.* is plac'd upon the top of the *Capsula*, it is therefore solid, and ending in four Buttons, which so shut the hollow Tube, that its impossible for any of the *Farina* to enter it. All these Flowers are viscid at the bottom, so as to retain the *Farina* which falls upon it, until it has emitted its *Effluvia*.

Arum has a thick, gross, solid *Stylus*, round whose lower part are plac'd the small *Globuli*, which afterwards become so many *Berries* as to make up the *Fruētūs Coacervatus*. The *Stamina* loaded with the *Apices*, or the *Apices* without any *Stamina*, are situated round the same *Stylus*, about the *Embryones*, that the *Farina* may fall upon them; but there is no Means of conveying it into their inner Substance.

These

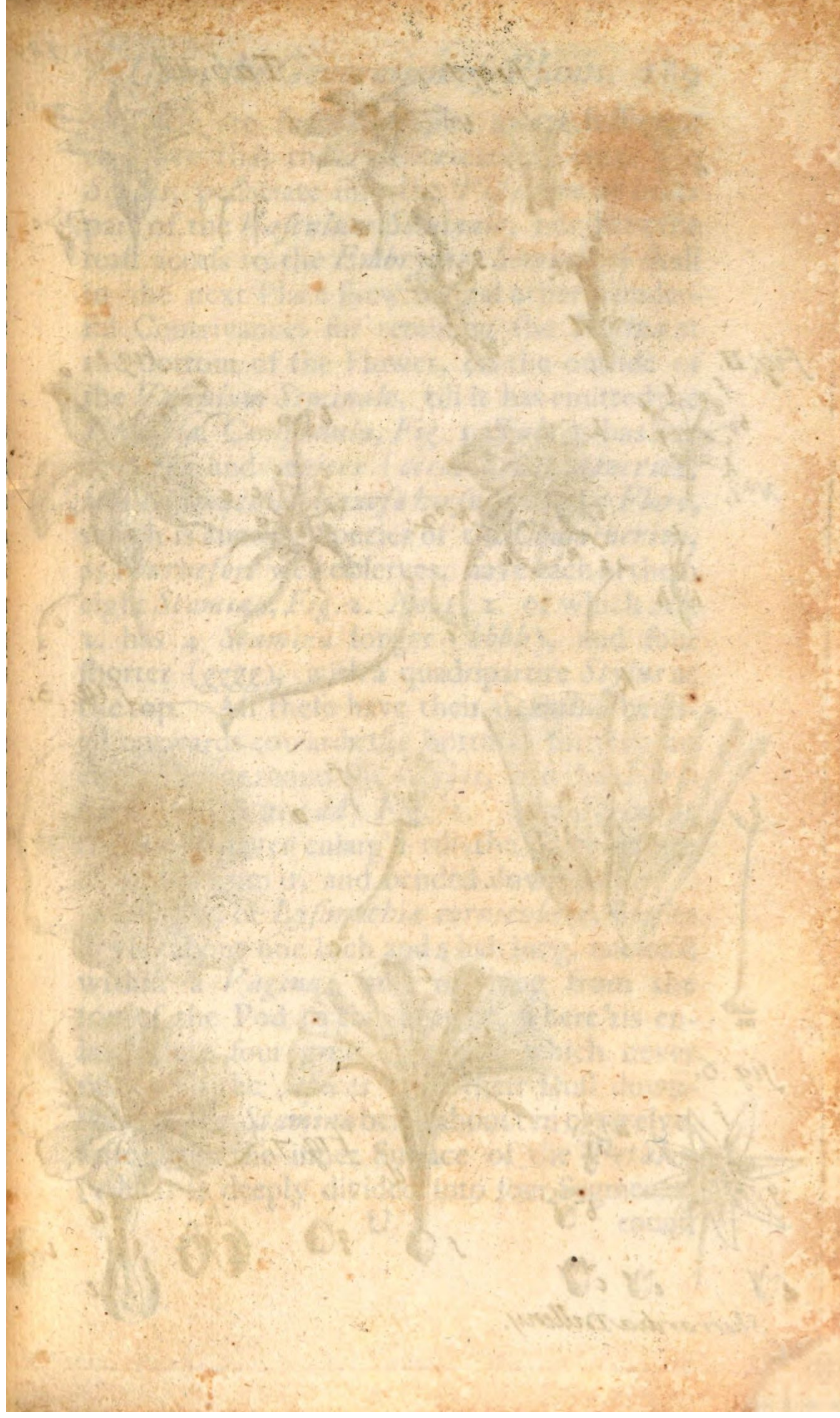


fig. 4.



fig. II.



fig. 1.



fig. 3.

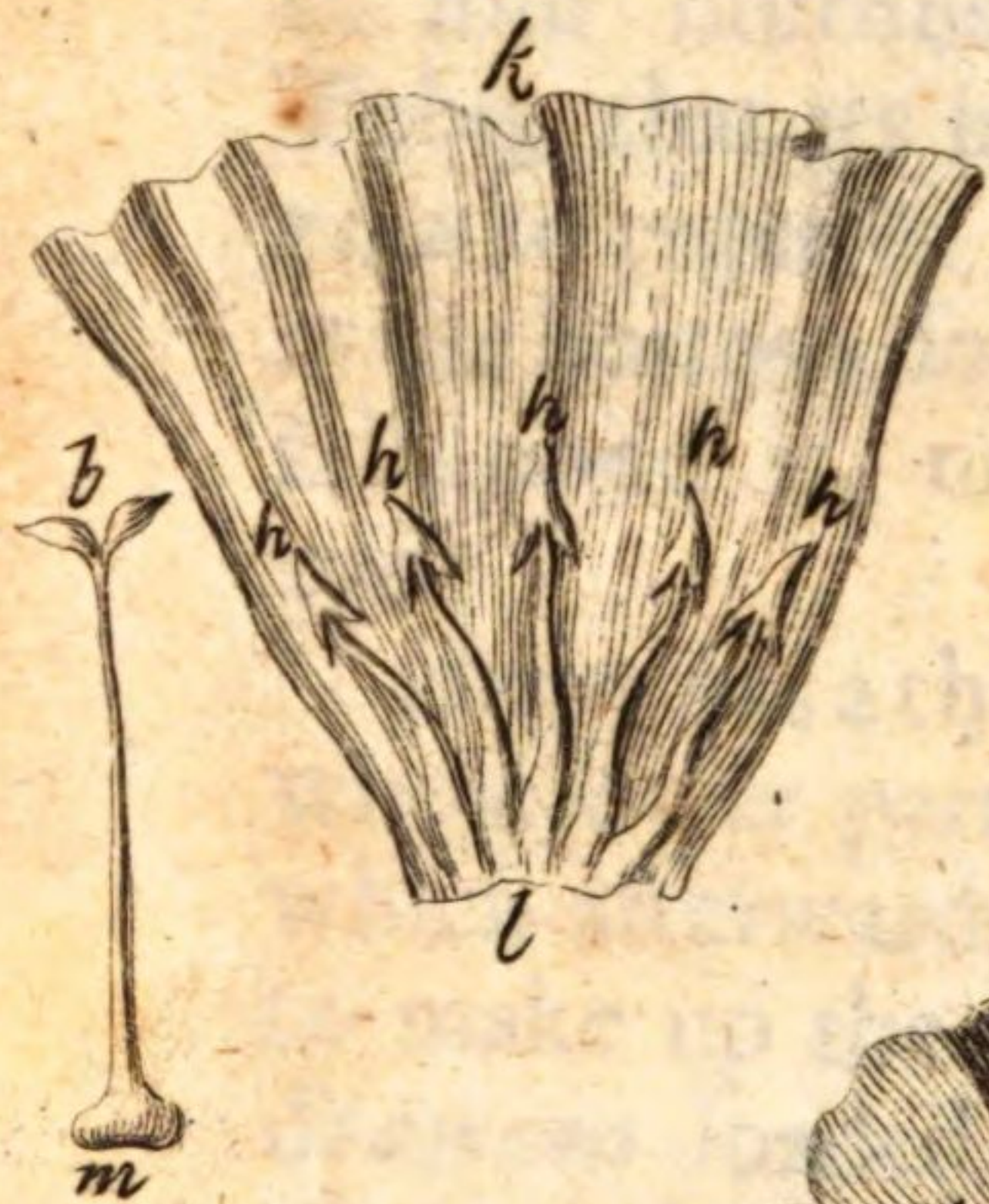
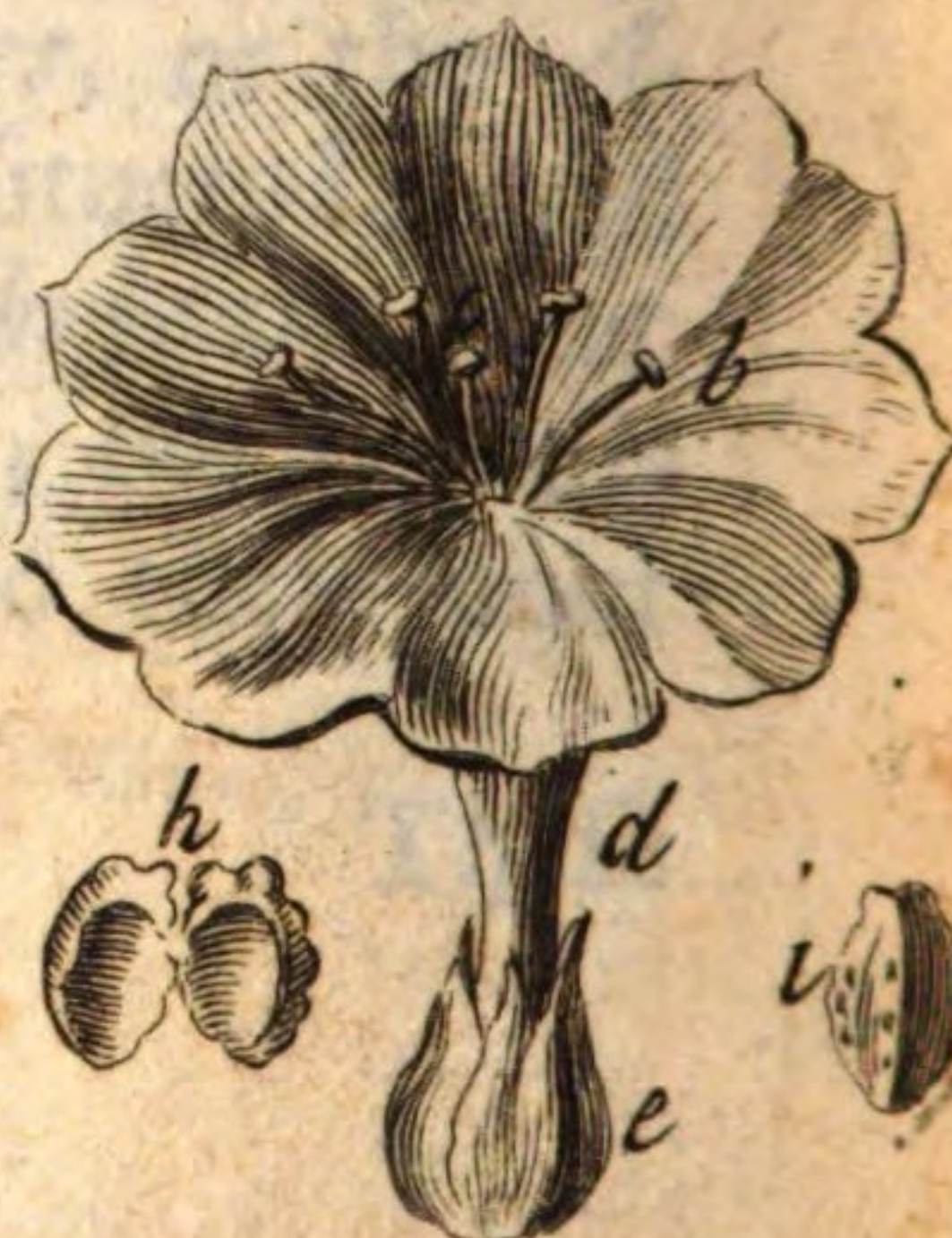


fig. 6.



fig. 7.



Sherrardia Dillenij.

These are such Examples as are sufficient to prove that the *Farina* cannot enter the *Stylus*, penetrate into the *Pistillum* or inner part of the *Vasculum Seminale*, nor have the least access to the *Embryones Seminis*. I shall in the next Place shew several other wonderful Contrivances for retaining the *Farina* at the bottom of the Flower, on the outside of the *Vasculum Seminale*, till it has emitted the *Effluvia*. *Campanula*, Fig. 1. Tab. 4. has five *Stamina* and *Apices* (ccccc). *Chamenerion*, and *Lysimachia filiquosa hirsuta*, magno Flore, which is another Species of the *Chamenerion*, as *Tournefort* well observes, have each of them eight *Stamina*, Fig. 2. No. 1, 2. of which No. 2. has 4 *Stamina* longer (bbbb), and four shorter (gggg), with a quadripartite *Stylus* at the top. All these have their *Stamina* bended outwards towards the bottom, forming an empty Space round the *Stylus*, for the *Farina* to lodge in (dd) Fig. 1. The *Stylus* at the top is never enlarg'd till the *Stamina* are separated from it, and bended downward.

Onagra, or *Lysimachia corniculata*, has its *Stylus* about one Inch and a half long, enclos'd within a *Vagina*, and reaching from the top of the Pod to the Flower, where'tis enlarg'd into four great Portions, which never opens till the *Apices* shed their Dust downwards, the *Stamina* being about ten or twelve, arise from the inner Surface of the *Petalon* (which is deeply divided into four Segments)

U

round

round the Edge of a *Pelvis*, or rather the top of a *Funnel*, into which the *Farina* falls, where being mix'd with a viscid Liquor, it gradually descends, and rests upon the top and out-side of the *Fruetus Rudimentum*, where it emits its prolifick *Effluvia*.

Convolvulus Major Albus, is a large, uniform, monopetalous, white Flower (*aa*) *Fig. 3.* with five *Stamina* arising from its bottom, and bended outwards, in order to form a Cavity, in which the *Farina* is lodg'd (*bb*) endow'd with so many *Apices* (*chhbbh*) and a *bifid Stylus* in the middle (*d. l.*) arising from the top, coherent to, but not continuous with the *Fruetus Rudimentum*. In the Interstices, betwixt the Origines of the *Stamina*, are to be observ'd five Holes in the bottom (*ggggg*) which could not be represented without cutting off the Borders (*f*) and removing of the *Stamina* and *Stylus*. These Holes are what never any Person observ'd before; for what I can learn, the *Farina* is lodg'd upon that side of the *Apices* which is towards the *Petalon*, and opposite to the *Stylus*; so that when the *Farina* is shed, none of it can touch the *Stylus*, but it falls into the *Holes* so plac'd, as to receive it; so that what by the Cavity form'd by the *Stamina* round the *Stylus*; and what by these Holes, all the *Farina* is retain'd without any Viscosity, till it has emitted its *prolifick Effluvia* to the tricapsular Fruit just below it.

The next Contrivance is a Viscosity, where the *Calix* becomes the Fruit, where there are Male and Female-Flowers, upon distinct Pedicles, and where there are certain Protuberances upon the top of the *Fruetus Rudimentum*, as in *Tab. II. No. 1, 2, 3, 4, 5.* See the Explication of the Figures of the Flowers of Cucumbers, Melons, Pomkins, Gourds, and Calabashes. All these are so obvious, that I need no more than to have Recourse to the Table for a Demonstration.

I come in the third Place to take Notice of a special Contrivance in the *Orange-Flower*, of which I have had the good Fortune to be the first Discoverer. It has been generally believed, that none of the *Esculent Fruit-Trees* had *Male* and *Female-Flowers* upon distinct *Pedicles*, until I first observ'd them upon *Orange-Trees* in Mr. *Fairchild's* Garden, where they are to be seen plentifully in the Months of *May, June, and July*, and sometimes in *April* and *August*. These *Flowers* are *Polypetali Rosacei* in *Tournefort's* Phrase, (*bbbb*) *Fig. 4. Tab. IIII.* whose Attire in Dr. *Grew's* Language, consists of several *Stamina*, so combin'd as to make up one Body, *Vagina*, or Sheath (*b.i.*) loaded with *Apices* surrounding a solid *Stylus* (*e*) with its Button (*a.a.a*) and situated upon the *Fruetus Rudimentum*, plac'd in the *Calix* (*f*). The *Male-Flowers* upon a separate Pedicle, have their attire consisting of a great many dis-join'd

U 2

Stamina,

Stamina, with their *Apices* (*m.n.*) without any *Stylus* or *Fructus Rudimentum*, but an empty *Calix* (*o*). This *Vagina* (*b.i.*) is so situated round the *Stylus* (*k*), and plac'd in the *Calix* (*l*), that whatever *Farina* either falls from its proper *Apices*, or the *Apices* of the *Male-Flower* (*m*) must drop down, and be retain'd upon the *Fructus Rudimentum*. The *Male-Flowers* are more numerous than the Female, and their Pedicles smaller, weaker, and more brittle; so that upon the least Touch they fall off, and casually falling upon the *Female*, they empty their Dust as well by that Means, as by being stop'd there when driven by the Wind; and this *Vagina* as readily receives and contains it, as a Cup or Vessel receives Rain from the Firmament. I have frequently try'd the Brittleness of the *Male*, and *Toughness* of the *Female-Pedicle*. The *Stylus* is so solid, that no *Farina* can pass that way; and though it did, the *Fructus Rudimentum* is close at the top, where the *Stylus* is join'd to it; and every one knows the Toughness of the *Orange-Pill*, so that there is no means of Entrance or Passage for the *Farina* through it, and yet the *Seeds* seldom fail to be *fecundated*, as appears by the *Oranges*, *Limons*, and all other *Fruits* of that kind rais'd from the Seed by Mr *Fairchild*, in his own *Garden*, of which he has a good Variety, and which he brings to produce *Flowers* and bear Fruit, before they are much above two

Foot

Foot high, as large as some that are brought from abroad.

Mr. *Fairchild* informs me, that he observ'd above twenty Years ago, those he termed *barren* (Male) and *fertile* (Female) Flowers, upon the *Malus Persica*, or Peach-Tree, which he could easily distinguish before the *Flowers* were blown. These two Examples of the Parenchymatous *Fruit*, such as the *Oranges* and *Lemons*; to which may be join'd the *Apples*, *Pears*, *Quinces*, &c. and Stone-Fruit, such as the *Peaches* and *Apricocks*; to which may be also join'd the *Plumbs*, and *Cherries* may give an in-let to the making both of useful and practical Observations: Useful so far as to let People know before-hand whether there will be much Fruit in such and such a Season, by considering the Proportion the Female bear to the Male Flowers, which it will be easy to discern, by the *Calix* or bottom of the *Flower* being fill'd or empty, even before it is blown; and practical, because when one finds the Male-Flowers exceed the Female in Proportion; and that for several Years they may fall upon Means to render the Tree more fertile, by dunging, pruning, &c. And here the Observation Mr. *Ray* had from the Farmers concerning the *Hemp* or *Cannabis*, holds good, " That when
" 'tis sown more thin, in fat Ground, the
" *Female* (which he mistaking the Sex calls
" the *Male*) Plants abound; and when sown

“ in poor Ground, or very thick in fat Ground,
 “ then the *Male* (called by him the *Female*)
 “ Plants abound^a”. We need be at no Pains
 to explain this, when we consider, that the
 more subtile Particles ascend first, and make
 up the *Farina*, and that the grosser Particles,
 which go to make up the *Embryones*, are la-
 ter in their Ascent. Nor are they so frequent
 in superficial as in deep Ground. So that if
 any observe too great a Quantity of Male-
 Flowers upon the Fruit-Trees, they are then
 warn'd to fall upon Means to prevent the
 Barrenness.

The fourth Contrivance is, that of the *Villi*
 or *Hairs*. This is more-especially to be ob-
 serv'd in the *Rose*, where there is a conspi-
 cuous Tuft of Hairs in the Center of the
 Flowers, surrounded by a great Number of
Apices, called *Anthera* by the Apothecaries.
 The *double Roses* seldom fructify, but if you
 shall take the *Hip* of one that's *semi-double*,
 as the *Gardiners* call them, and open it when
 it begins to swell, and the *Seeds* begin to form,
 then you may observe several of these *Villi*
 tending to each of the *Acini* or *Seeds*; but
 they do not convey the *Farina* to the *Seeds*,
 as Mr. *Morland* would have them, for they
 are spread forth and surround it, and the *Seed*
 is as much shut at the upper as the lower end;
 so that the *Farina* cannot enter it; and this Con-

^a Catal. Plant. circa Cantabrig. p. 26. Edit. Anno 1660.

trivance seems only to be, to transmit the *Effluvia* from the *Farina* in greater Abundance to each *Seed*; for the Membrane of the outer Coat being thick and hard, needs a greater Supply of spirituous Particles to set its inner Substance in Agitation. And as to the Hairs of the *Strawberries*, it will be found that most of these arise from the *Placenta*, pass through betwixt the Interstices of the *Globuli*, and so keep the Berry from falling off too soon; for its but very slenderly fix'd to the *Placenta*, and would soon fall off when the *Globuli* are fill'd, before the Fruit were ripe, if it were not for a glutinous Humour, and these Hairs which keep it firm in its Place. The like is also to be observ'd in the *Rubus*, so that this Example will serve no more for Mr. *Morland's* Purpose than any of the rest.

I come *next* to propose some more Arguments against the *Farina* entring the *Stylus*; and, 1. Did the *Farina* enter the Seed-Vessel, and were each Grain introduc'd into its proper Receptacle, then it would follow that these nearest the top being first fill'd, would first augment and ripen, *v. g.* In a *Tulip* there are six Rows of Seeds, in three *Loculamenta* or Pouches, regularly plac'd, the Grains of the *Farina* entring the top of the *Pistillum*, and gradually descending, would fill the proper Receptacles or Husks of Seeds as they went along; so that those at the top would be firm and hard, when those below would be but

empty ; whereas the contrary is plain. For as the *Leaves* and *Flowers* of Plants, nearest to the *Root*, are first spread forth, and first blown, so the *Seeds* in the *Pod* or *Seed-Vessel*, nearest the *Pedicle*, are either first fill'd and ripe, or the nutritious Particles being equally distributed to all, the *Seeds* fill and ripen equally, which they would not do were there a gradual Descent of the *Farina*, and without that each Seminal Plant of the *Farina* could not find out its predestined *Case* or *Nest* wherein to lodge.

In the *Papylonaceous* Plants, such as *Peas* and *Beans*, the entring by the *Stylus* (which by the by is not cavous, but hard, solid, and cartilaginous) into the *Pod*, will not do ; for there must be a long Tube or Duct running down the back of the *Pod*, with a Door or opening to each of the Seed Cases, by the several *Placenta's* which wants to be found out, and a hollow Tube to each of the *Seeds* in the *Fruits*, where the *Seeds* are adherent to separate *Placenta's*, as most of them in the filiquous Plants are. These Considerations want new Discoveries.

2. The Quantity of the *Farina* must be proportion'd to the Quantity of the *Seeds* ; so that where there are many *Seeds*, the *Farina* must be in large Quantity ; and where there are but few *Seeds*, a small Quantity will serve ; for there must always be an Allowance of some to be lost. *Jallapa*, or *Mirabilis Peruviana*,

Peruviana, Fig. 5. cap. Tab. III. has a *Monopetalous Flower* (A) five *Stamina* (B), a *Stylus* with its *Button* (i) has only one *Seed* enclos'd (F. G.) within one *Capsula* (H) The *Farina* is so carefully preserv'd from the Danger of losing, that it can be safely convey'd down to the *Capsula* (F) by a long Tube (D). *Nicotania* has a *Monopetalous Flower*, Fig. 13. Tab. I. divided into five *Segments* (aaa) with the *Stylus* in the middle; and its proper *Button* (b) surrounded by five *Stamina* and their *Apices* (c.c.). The *Pistillum* becomes a large conical *Fruit* (a) opening longitudinally (b), and contain'd within a *Monophyllous Perianthium* (c), containing a vast Quantity of small, minute *Seeds*.

Caprifolium of Mr. Morland has five *Stamina* and *Apices* to one *Berry*, containing one *Seed*. *Papaver* has a great many *Apices*, and the *Seeds* do not amount to above half the Number of *Nicotiana*, *Avellana*, *Nux Juglans*, have but one *Kernel* to each *Nut*. *Abies*, *Pinus* have twenty or thirty to each *Cone*; and the Number of the *Juli* in the *Avellana*, exceed that of the *Amenta* in the *Abies*. *Lappathum*, *Acetosa*, *Atriplex*, *Parietaria*, have several *Stamina*, *Apices*, and much *Farina*, and yet there is but one naked *Seed* to a *Flower*, to which the *Farina* has much more easy access than to a *Capsula*.

All these Examples, duly consider'd, cannot but infer another manner of Impregnation than

than each Grain of *Farina* to a *Semen*: For as *Nature* is *uniform*, so it is always *consistent* with it self, and therefore 'tis not to be suppos'd there would be as great an *Apparatus* of *Farina* to *Jallapa*, as to *Nicotiana*, and as great Care had in preserving the one as the other. If but one Grain can only be employ'd in *fecundating* the Seed of the *Jallapa*, and there is above one hundred to be impregnated by the same Quantity of the *Farina* in the *Nicotiana*, is not that inconsistent, that there shall be a quadruple Quantity of *Farina* to half the Quantity of Seeds in the *Poppy*; that every Berry with one Seed shall have a proper *Flower* in the *Caprifolium*, and that a greater Number of *Katkins* shall be requir'd to one *Kernel* in *Nux Juglans*, than to twenty or thirty in *Abies*, *Pinus*. I hope all these Instances will set People upon another way of thinking concerning the Impregnation of Seeds in Plants; for as I am as much convinc'd as any, that no Seed can be fertile without somewhat to actuate and enliven it, from those call'd the Male Parts of the Flower, where there is a particular Preparation us'd for certain Particles fit for that purpose; so I cannot detain my self after so many probable and convincing Arguments, so many pregnant, and I may say undeniable Proofs, and so many demonstrable, real Facts, from pronouncing that this Impregnation can be no otherways perform'd

than

than by some *Emanation*, some *vivifick Effluvia*, some *prolifick Virtue* communicated by means of this *Farina*, or some other *Menstruum*, from the *Male* to the *Female* Parts of the *Plant*, by virtue of which the Parts of the *Seed* are dispos'd to be dilated, the *Tubuli Nutritivi* enlarg'd, a greater Supply of *Nourishment* to be furnish'd, and all the Particles composing the *Seed* so to be set in Motion and regulated, that they can be augmented, extended, and encreas'd to a due Proportion, which one Grain of small Dust, so confin'd, could never do.

I have added *some other Menstruum* than the *Farina*, because of the *Water-Plants*; where, though generally speaking most of them set their Head above the Water before they begin to flower; yet since they can never be kept dry, and consequently the *Farina* must be always form'd into a Paste; therefore the *Menstruum* here, must be that viscid Liquour so often mention'd, which transudating the Pores of the *Apices* and *Stamina*; and being of so tough and balsamick a Consistence, it cannot easily mix with the Water, but floating along, may be convey'd from a *Male* to a *Female-Flower* of the same *Plant*, there to fecundate the *Seed* in the *Seed-Vessel*, as much as the *Farina* do's when driven with the Wind. And let any one judge whether the *Seminal Plant* can be contain'd in this Liquor, any more than in the dry *Farina*. I acknowledge

I was very much straitned how to do with the Flowers in Water-Plants, in relation to the *Farina* and this *Fecundation*; but having only receiv'd a small Hint from *Dillenius*, in his Description of *Hippuris*, or Horse-Tail, which fructifies though 'tis never to be seen above Water. I am the first who have made this Improvement of it, being persuaded this is as effectual in the Water, as the other is in the Air.

And why should that of Impregnation by the *Effluvia* seem improbable, when we have so frequent Experience of the Divisibility of Matter, and of the wonderful Effects of a few active, volatile, spirituous *Particles*. *A little Leaven leaveneth the whole Lump*, if I may use a Scripture Phrase when contemplating the wonderful Works of *Almighty God*. A small Quantity of an acid, will sowre a great Quantity of Dough; one Grain of Musk among Cotton, will scent several Pounds of Powder of Starch, if successively put in amongst them; and that Powder will scent a great deal more, if mix'd with it while the Musk shall lose nothing of its Weight. The smell of a few Violets will continue in a Handkerchief a good time. The *Effluvia* of some Creatures, such as Cats, &c. will be noxious to some, and throw them *in Deliquium Animi*, while others present shall not be sensible of it. One Grain of *Laudanum* will affect perhaps twenty five Pound of the Blood of a Man's Body;

Body ; it will calm and quiet his Spirits, and dispose him to rest amidst the most raging and violent Fevers ; when all the volatile Particles of the Humours of his Body, are as it were in a Vapour and Smoak, it will compeſce and fix them, as Water will quench and extinguish the Fire when thrown upon it. One Drop or *Gutta* of Oil of *Cinnamon*, *Mint*, or *Anise*, will impregnate a great Quantity of Sugar, and affect the whole Air in a large Room, and the more it is divided, the more lively it affords the Smell.

Theſe, and a great many other parallel Caſes, may be ſo convincing, that we need only to have recourſe to the *Effluvia* for the Explanation of ſo great a Myſtery as that of the Generation ; for then we can conceive how the moſt ſubtile and vaſtly divided Matter, to which no Pore nor Part of a Plant can deny the *Transitus*, may produce ſuch ſtupendious Effects ; but if we will ſuppoſe the *Seminal Plant* to be in each *Granula*, each ſmall Particle of the *Farina*, how difficult will it be to find out ſo much as a probable Paſſage for it ? For we muſt ſuppoſe this Grain of the *Farina*, however minute, to be an organiz'd Body, conſiſting of a *Congeries* of ſuch and ſuch Particles, and ſo diſpos'd and compos'd, after ſuch and ſuch a manner of ſo many other little Particles, that every ſmall Pore will not do the Work. For it muſt be ſo and ſo directed, and there muſt not the leaſt
Impediment

Impediment be in the way ; but it must be as it were hood-wink'd, and led by the Hand into the very Place prepar'd for it ; and if it meet with the least Obstacle, it's in hazard of being shiver'd to Pieces ; and its fine and delicate Texture is in danger of being dissolv'd, so that it may come to perish before it should receive its Life. And pray what a happy state and Condition should we be in, when our want, or having of Bread, must depend upon the accidental getting of one Grain of the *Farina* into each particular *Embryo Seminis* of the Wheat ? Might not an accidental Blast of Wind shake off all the *Farina* from every *Apex* in each Spike or Head of the Wheat, and would it not by that means remain empty, so that we should have no Bread to eat ? Nor would the unimpregnated Seed produce and let us have a new Crop against next Year. Whereas, when we suppose an Emanation to flow from the *Farina* in the *Apex*, so soon as it is ripe, the Wind is so far from hindering its Operation then, that it furthers it, and we need be at no Difficulty to conceive how the Seed may be fill'd, ripen, and rendred fertile.

Having asserted, page 225. *That the Propagation or the Production of the Species, was the effect of the vegetative Life in Animals as well as in Plants.* I come now to make good the Analogy. These now called *Ovaria*, were by the ancients called *Testes Fœminæ*,

Fæmineæ, and they then suppos'd that the Impregnation proceeded from a Mixture of the *Semen Masculinum* with the *Fæmininum* in *Utero*. But it being afterwards discover'd, that these they call'd *Testes*, is a *Congeries* of certain little *Globuli*, compactly united, consisting of a viscid, limpid Substance, within a proper Membrane, and all involv'd within a common Tunicle, call'd *Ova* or Eggs, one of which, after a fertile *Coitus* is detach'd, receiv'd into a certain Passage, called *Tubæ Fallopiæ*, from *Fallopins*, the Discoverer, convey'd into the *Uterus*, there to increase and become a *Fætus*.

The manner of this Impregnation is as much disputed as that of the Seeds of Plants; some asserting the *Materies Seminalis Masculina* passes directly to the *Uterus*, and from thence to the *Ovarium*, either in Substance, or by certain *vivifick Particles*, to to which the gross Substance is only a *Menstruum*. Others deny their Entry to the *Uterus*, but will have them to be receiv'd directly into the Blood-Vessels, round the *Vagina*, and that passing along with the Blood in the Circulation, they impregnate one or another of the *Ova* when they arrive at the *Ovarium*. All this time there was no thought of the *Animalcula* to contain all the Lineaments of an *Embryo*, and that one of them must be convey'd to the *Ovarium*, and enter a particular *Ovum* there, to be nourish'd, encrease, and be augmented,

mented, so as to become a *Fœtus*, until the Perspicacious Mr. *Lewenhock*, by his Microscopical Observations, discover'd them to be in *Semine Masculino*.

I shall not doubt of the Existence of these *Animalcula*, for that would be to call in Question, not only Mr. *Lewenhock*'s own Credit and Veracity, but also the Testimony of several Valuable, Ingenious, Noted and Learned Persons, of great Integrity, Fame, and Reputation, who affirm they have observ'd the like. But whether these *Corpuscules* be actually the *Embryones*, containing all the Lineaments, which are afterwards to encrease, be augmented, and form'd into a *Fœtus in Utero*: Or whether they be only certain little *Animalcules* living and moving in their proper Element, as Terrestrial Animals do upon the Earth, or Fishes in the Water, is the Question.

Dr. *Lister* has fav'd me the Trouble of stating a Question suitable to this Purpose, which I had a mind to do long ago; and before I knew he had meddled in the Debate, viz. *An hæc Animalculorum proles fere diurna sui similibus Animalibus generentur? An sponte nascantur?*

Mr. *Lewenhock*'s Answer to these Questions, is as follows. “ Now, says he, if we know “ which way the Fishes do encrease, that it

^a Philosoph. Transact. No. 244. p. 337. Lister exercit. Anat. tert. p. 114.

“ is not done by intermixing of the Male
“ and Female Seeds ; and likewise we do know
“ the great Mystery that is included in the
“ small Seed of an Apple ; why might we
“ not then assert, that *a whole intire Man*
“ *is contain'd in an Animalcule of the Mas-*
“ *culine Seed, and that the Animalcules of*
“ *the Male-Seeds are all descended from*
“ *the first created Man ?*

I cannot but think Mr. *Lewenbock* has been much put to it for Answer to those pinching *Questions*, when he was oblig'd to use such Subterfuges, which are mere Hypotheses, and no ways demonstrative.

The Opportunity I have had of enquiring more particularly into the manner of Generation of the *Salmon*, which I lately communicated to the *Royal Society*, has convinc'd me, that the Generation of Fishes will not favour Mr. *Lewenbock's* Opinion. For *eo Momento*, that the Female Fish ejaculates the Roe, the Male is ready to throw the Milt upon it. The Roe is a *Congeries* of a vast many little, firm *Globules*, compactly united.

^a Transact. No. 255. p. 270. Cognitâ piscium generatione, quòd nempe illa non peragatur nisi ex seminali marium foemellarumque commixtione; cognito quoque magno illo arcano, quod in unoquoque mali semine latet eique inclusum est ; quid obstat quo minus statuere liceat in animalculo ex semine virili integrum latere hominem, atque animalcula ex seminibus virilibus ab primo quoque homine originem suam trahere. Epist. 117. p. 99. Ad Societatem Regiam Jun. 27. 1699.

The Milt is a softer, flexile, and as it were Milky Substance. The Difference of the Consistence do's not admit of an entire Union or intimate Commixtion of both ; but the one being thrown out first, is the lower, the other lies above it. The strict Union and Compactness of these *Ovula*, plainly denies free access to the *Animalcula in Semine Masculino* into every one of them ; but the *Effluvia* from the *Milt* is capable enough to set the Seminary Particles in the *Ova* in Agitation, to be rang'd, form'd, and put in such Order as to compose a small *Smelt*, while the grosser Substance, as it is a *Menstruum* to the more subtile, so it serves as a *Fomes* to the *Ovula*, as the heat of the *Hen* serves to hatch a Chicken ; so that Fishes in that respect are Oviparous Animals in the Water, as Birds are on the Earth.

For the Mystery of the Seed of the Apple, by its being the Successor of a regular Flower, it makes no more for Mr. *Lewenhock's* Purpose than any other part of the Creation ; but if we only look upon them as being impregnated in common with other Plants ; and if we consider the Multiplication of the several Species, we may look upon *Nicotiana* to be more apposite to his Purpose, according to *Sennertus's* Calculation.

But I do not see of what Force these two Instances can be to prove, *That in an Animalcule of the Masculine Seed is lock'd up a whole*

whole Man, and that the *Animalcules* of the Seed are descended from the first created Man. Almighty God might, if he had pleas'd, have continu'd the first created Man till this present Time, and might have ordered it so that his Body should consist of the very numerical Particles it did when he was first created. In that case these *Animalcula* might have continued from the first created Man. But since in his Wisdom he has not thought fit so to do, but has ordered it so that the first Race should die, in order to make room for succeeding Generations ; and since he has so dispos'd of the Bodies of Animals, that they do not always consist of the same numerical Particles ; but that *Hominem vivere est continuò mori* ; that our very Life consists of a continual *Dispendium* of the more subtile and volatile Particles, instead of which we are daily furnishing our selves with a new Supply of nutritious ones, which when sufficiently attenuated go off in their Turn, so that our Body is made up of a daily Course of succeeding Particles, as the World is peopled by a continual Course of succeeding Generations ; and how this Identity of *Animalcula* should continue without a *proles fere diurna à sui similibus Animalculis*, I do not understand.

It's a very suitable Question of Dr. Lister's *An sponte nascantur* ; and Mr. Lewenhock's Answer is well enough to the purpose. “ Now, “ says he, that these Animals should come or

“ proceed from themselves, seems to me not
 “ to be apprehended; for if they should come
 “ from or out of themselves, I imagine that
 “ they could not be all endow’d with the same
 “ Quality as now they are^a. *Philosoph.*
Transact. Ibid.

Then the Question returns, are they all of the same Quality? then they must be organiz’d Bodies, consisting of the same Lineaments, having the same Figure, Shape, and Features. And how can they be thus generated, unless there be Males and Females among them, as among all other Animals? 2. If they have proper Males and Females, then they must be a distinct Species from that of a Man; and if so, how can a whole Man be lock’d up in the Seed of a Man? Since then it must be granted that these *Animalcula* are the Product of Male and Female of their own Species (otherwise the whole Course of Nature is perverted in one of its most essential Regulations, *viz.* that of Generation, which is not to be suppos’d) and are quite distinct Creatures from that of a Man. It is impossible they can be the first Lineaments of a human *Fœtus*; for then there would be a Transmigration of Bodies, from an Insect to a Man,

^a Quod verò an *Animalcula* sponte oriuntur, id ego, ut verum fatear, concipere nequeo: Si enim illa *animalcula* sponte suo prodirent, tunc non omnia *animalcula* masculina iisdem qualitatibus prædita fore mihi persuadeo, quod tamen nunc obtinet. *Ibid.* p. 198.

which

which is utterly absurd, and altogether inconsistent with the Divine Majesty of God, and with that Dignity he has conferr'd and bestow'd upon Man, by making the very Spawn and Dregs of the vilest of all Creatures (for Insects are so according to the Nature and Station they bear in the World, however fine and curious their Texture may be) become the Parents of the Lord over all created sublunary Beings; and how much must they be so, when they are ordain'd for Slaughter so soon as they have Life? What Murder and Havock must there be made of them, when one of many Thousands has only the good Fortune to be preserv'd? But another Question is, whether they are dead or alive at the *Coitus*? If they are not alive, then they cannot be called *Animalcula*; but Mr. *Lewenhock* seems to be positive they are alive; if so, they must lay down one Life which they enjoy'd, previous to the *Coitus*, and take up another after the *Coitus*; for there is nothing more plain and obvious than at, or immediately after the Impregnation, the *Fætus* partakes equally or proportionally of the Female as well as of the Male. The Features, the Gestures, the Humours, the Tracts of Face, the Temper, the Stature, the Voice, the external Shape and Figure of the Body; the inward Passions of the Mind, the Distempers, and frequently the virtuous and vicious Inclinations, are as much imparted to us by our Mothers as by

our Fathers ; and this is obvious to us every Day, in those they call Mongrel Animals ; when a Ston'd Horse and a She-Afs produce a Mule, which though it exceed the Mother in Bigness , yet it partakes very much of her in Shape, and particularly the Voice, which is called the Braying. And when of a Bull and a She-Afs is procreated a certain Animal, called *Joumar* *, as I am credibly inform'd by the Intelligent Dr. Sherard, who has often seen them in *Turkey*, where they are very frequent, and of great Use, as being excellent Beasts of Burthen, and of a quick Pace upon a March, a property not very incident either to Father or Mother. This *Animal* is a compound Mixture of both, and by being so, of a very unusual Shape. Though these Animals, as it is generally believ'd, are condemn'd to a perpetual Barrenness, to prevent the confounding of the Species ; yet they with the former Instances, are sufficient to demonstrate, that there is more requir'd of the Female at the Impregnation, than to furnish a mere Case, *Nidus* or Nest in the *Ovum* and *Uterus*, for the *Embryo* to lodge in, and only to afford Nourishment to it as well before the Birth, as she do's Milk after it: So that I have very good Reason to join with a certain Correspondent to Sir C. H. in the *Transacti-*

* See its Figure in St. Leger's Histoire de l'Eglise Vaudois, fol.

ons, when speaking of his Observations on the Animals in Waters.—— “ And I am confident, says he, many of these are the same Creatures, under different Dresses ; for I have noted such a regular Process in them, and such a constant Order of their Appearances, that I am of the Opinion most of them are the Product of the same invisible, volatile Parents, and generated like Gnats, and many other Sects of Flies^a.

This leads me into a Query which should have been propos'd by Mr. *Lewenhock's* Followers ; for *Affirmanti occumbat probatio*, (for by what I find, he do's not account for it himself) *viz.* How came the *Animalcula* into the *Vesiculæ Seminales* ? And, 2. Why are they rather to be seen in the *Sperma*, than in the Blood, Bile, or Urine ? For the first, I suppose, and its pretty plain and obvious, that our Meat, Drink, and the Air we breathe in, are full of the *Ova* of *Animalcula* ; for they are continually deposited upon the Flower, the Bread, the Flesh, the Water. When we are adult, our Stomach is capable to attenuate and digest, not only the Aliments we ingest or take in, but also most of these *Ova* must undergo the common Fate of a Comminution and Attrition of their Particles. But when we are under Age, and our Stomach is weak, then it is that the *Ova* escape,

^a Philosoph. Transact. No. 214. p. 1366.

and the Maggots are generated in our Body; some of the coarser, because they cannot enter the Pores of the Lacteal Vessels, are generated in the Intestines. Hence it is that very few Children are free of Worms; it's to be presum'd and pretty plain, that these Maggots may deposit their *Ova* in the Intestines, some of which may be so small as to get Admittance into the Lacteal Vessels, whence mixing with, and circulating along with the Blood, they can be the more readily separated from its Mass by the *Vasa Spermatica*, than any other Substance, because, when *Ova*, their Surface, is polite and smooth; and consequently, if they be so minute as to enter the *Tubuli*, they can easily be convey'd along the vast Quantity of Gyres, Meanders, Turnings and Windings in the *Testes* and *Epididymides*, 'till they arrive at the *Vasa deferentia*, and thence pass into the *Vesiculæ Seminales*, whither there arrives daily Addition, until the *Pubertas*, that is, the Evacuation, begins; for as we see before the Birth of the *Fætus*, the Intestines are full of the *Meconium*, and the Bladder is full of Urine, so we may suppose a continual Addition of new Particles to stretch forth and extend the Cavities of the Seminary Vessels, 'till the Boy is of Age; and this Substance may as readily consist of these *Ova* as not, when once they are there; and in a quies, 'tis easy to believe they may become minute *Animalcula*, and so obduce the Surface

of

of the *Vesiculæ*, that they will never be free of the Spawn, so long as the Age of Fertility continues; and this seems to be demonstrable enough, from the *Worms* in the *Vesiculæ Seminales*, which Mr. *Lewenhock* observ'd in a young Ram before he had begun to copulate. And for the *Proles fere diurna*, the Generation of Insects is every where so sudden, that if you observe a *Chrysalis* (in which a Worm had been wrap'd up) full the one Day, next Day you shall see it empty, and the Butter-Flies got out of it flying abroad in their full Stature and Bigness, who when they have liv'd some time copulate, deposit their *Ova*, and shortly after die. These *Ova* are so numerous, that it's computed one Female-Silk-Worm shall emit three hundred *Ova* or Grains, more or less, after one *Coitus*; so that there's no Difficulty to conceive how, (if once these *Animalcula*, though but a very few, get into the *Vesiculæ Seminales*) they may leave a numerous Spawn behind them when thrown out, and how they can be so suddenly generated. As to the second Question, Why they are only observ'd in the *Sperma Masculinum*, and not on the other Fluids of the Body, such as the Blood, and the several other Secretions from it, as the Bile, Urine, *Saliva*, &c. The Blood being a Composition of all the various Particles of the other Fluids, appears under a more solid form in *Globules*, where the several Particles are compactly and firmly united,

ted together, so that if there be any *Animalcula* or *Ova*, they are not so easily to be discern'd, unless the Particles were dis-united, and then it would cease to be Blood; and for the *Serum*, in which the *Globules* swim, as we must suppose the *Ova* or *Animalcula* to have somewhat of a solid Consistence, they can never make up a part of that Fluid: Neither can the Bile or Urine, separated from the Blood, contain any of them, because the Texture of their Particles is such, that neither the Glands which separate, nor excretory Ducts which convey them, will admit of any other; so they seem only to be adapted for the *Ductus Spermatici*, where, when *Ova*, they can easily descend, and when *Animalcula*, by the Flexibility of their Body, they can easily undergo the various Turnings and Convolution of the *Tubuli* in the *Testes*.

Thus I have accounted how the *Animalcula* may come to be only in the *Vesiculæ Seminales*, supposing them to exist; but this do's not contradict the Doctrine of the *Effluvia*; for these *Animalcula*, being *Organiz'd Bodies*, as I have observ'd when speaking of the *Farina* in Plants, must make up the grosser Part of the *Compositum*, so that the more subtile may lodge in the Interstices, betwixt these *Corpuscles*, and by being more active and volatile, may be first set in Motion, so that during the *Coitus*, they may reach the *Ovarium* or *Ovum* it self, while
the

the other can penetrate no farther than the *Vagina* or *Corona Uteri*, so that the one becomes only a *Menstruum*, a guard to the other to conduct it in its way; and the one can fly to actuate and enliven the *Ovum*, while the other is fain to stay behind.

But farther, let us consider the Certainty and Determination of the Number of the *Ova*, to be impregnated at a fertile *Coitus*; how humane Females, and the Females of other Animals, such as Cows, Mares, and most of the larger Quadrupeds, have only one *Ovum* impregnated at a Time, and if there be any more, that's preternatural, because exceeding the Determination for such an Animal to be propagated so and so at the Creation; how there is no Superfetation, but that after one *Ovum* is impregnated there can be no more (unless preternaturally) during the Time the Product of such an *Ovum* is in *Utero*; how again, lesser Quadrupeds, such as Bitches, Cats, &c. can have several *Ova* impregnated at one *Coitus*, without a Superfetation, and how others have naturally a Superfetation, such as Hares, Rabbits, &c. and after every *Coitus* they produce a new Litter of *Fætus's*, even while the former shall remain in *Utero*. Can all this proceed from an accidental getting of the *Animalcula* into one or more of the *Ova*? Must it not depend upon a previous Disposition of the *Ovum*? Can a minute *Animalculum* contribute any thing towards

towards this Disposition ? Must not the Particles of the *Ovum* have been so and so regulated and dispos'd, before such an Impregnation ? And do's not the very determinate Number of the *Ova* impregnated at such and such a Time, demonstrably prove that ? Why, then, shall we suppose, that so soon as an *Animalculum* gets into the *Ovum*, all these wonderful Effects, as the Consequence of the simple Act of the *Coitus*, shall be perform'd ? If in an *Animalcule* of the *Masculine Seed* of a *Man*, a whole *Man* is lock'd up, then the several Particles previously in the *Ovum*, are no more than the first Food to this Stranger ; this new arriv'd Child (who after being fatigu'd by so long a Journey, and through so many difficult and unaccessable Roads, when all those in Company with him have been so wearied, that they are left behind and kill'd) has need of such Refreshment to rouse up his Spirits, and to make him grow up so as to become a brisk and lively Boy. But if in the Female *Ovum* there be such a *Congeries* of Particles of different Textures heap'd up together, as to furnish the first Materials for all those various Substances of which the animal Body is to be compos'd ; is it not more reasonable to suppose, that this Substance only wants somewhat to actuate and enliven it, and to set all these Particles in such a Motion, that they may be regulated, rang'd, and set together so as to form the Lineaments of a

Fætus,

Fætus, so soon as this prolifick Virtue is communicated to them ; and to suppose, that not only the Particles in the *Ovum* it self are set in Agitation, but likewise that the whole Mass of the Blood assists in furnishing a continual, fresh Supply of new Materials, in order to rear up this fine, delicate, and curious Fabrick of the Animal Body ? And that until these different Substances be got together in such a Proportion as to lay the Ground-work within the *Ovum*, and that the immediate *Artifex*, the Male-Animal, being influenc'd by the great Author of all Things (*for a Sparrow doth not fall to the Ground without the Will of God*) cannot operate, set these Materials in Motion, till all Things be got together ? So that as it's plain that the *Ovum* cannot be impregnated before its Particles are dispos'd in such a manner, and in such a Proportion ; so its likewise plain, that the Seminal Matter must be previously in *Ovo Fæmineo*, and not in the *Animalcula* in the *Semen Masculinum*.

To render this still more obvious, let us enquire how an *Animalculum* an *Organiz'd Body*, formerly swimming at Liberty, now confin'd to narrow Bounds, and render'd unactive, shut up as it were in a Prison, and only receiving what Supply of Nourishment is furnish'd to it, *en Passant* ; I say, how such a minute Animal as this, so small and light that some Hundreds amount only to the Weight of

s

one

one Grain, shall infer such vast Alterations upon a whole Female Body, and actuate upon perhaps twenty five Pound Weight of Blood, when it cannot so much as get out of its *Caluſtrum*, unless it is abortive, miscarry, and be sent a packing: Can this small *Mite* be capable to render Her who was but a little before a handsome, ruddy Fac'd Girl, now become pale and wan coloured, and Her who was wont to be pale, so that scarce any Blood was to be observed in her Face, now become of a ruddy and gay Countenance? She who usually had a full Face, big Cheeks, little Mouth, brisk, lively, piercing Eyes; her Eyes now become dull and heavy, the Skin bluish below the lower Eye-lid. The Face formerly full and round, is now long. The round Cheeks now become thin and wrinkled, and as it were cleaving to the Jaws, the Eyes hollow, sunk and staring, and the Mouth big, wide, and gaping. She who was vigorous and active, now becomes dull and heavy; and She who was watchful in the Night, and could get up early in the Morning, being thoughtful upon the Account of her Amours, if a Maid, and taken up with the Cares of her Family and Children, if a Wife, now becomes lazy, do's not care to stir about nor move, but when she is a Bed loves to loll upon her Pillow, and when got out of it, throws her self down upon every Couch, and is inclin'd to sleep in every Corner. She who had a good Digesti-

on,

on, did eat her Meat with a pretty quick Appetite, now loaths at every Thing she sees, and the Victuals she formerly delighted in, that she now abhors, and longs for what formerly she hated, and is improper for her, and what perhaps is not to be got ; and now she forsakes her former Delicacies, and loves to take what is so coarse, that none else will eat it besides her self ; her Pulse is feverish, her Stomach is sick ; she is squeamish, has frequent nausea's, especially in a Morning, and often she vomits ; she has frequent Inclinations to Spitting, and often subject to Faintings, *Deliquiums*, Head-aches, Feebleness, Weakness, &c. Before she began to breed or conceive (as it is called) her *Abdomen* was little, round and plump, now her Navel is drawn in, as it were, to her Back-Bone, and she becomes smaller round the Middle than formerly. After a short Time she begins to swell, the *Uterus* to be extended the *Placenta* and Navel-String to be form'd, and the *Chorion* and *Amnios* to surround and wrap up the *Fætus*.

And whence all this ? The little *Animalculum* is now enclos'd, all its Companions, the Fellow *Animalcula*, they are dead, extinct, and unactive, none of these can do this Work ; it must be somewhat else, some extraneous Bodies, some extrinsick Particles, and at first heterogeneous to the Texture of the Blood, which has proceeded from without, and previously was a Stranger to the Female Body.

And

And what else can it be than the spirituous Particles from the *Male*, which issuing from the groffer Substance of the *Sperma Masculinum*, not only actuates and enlivens the Particles included in the *Ovum* it self, but howsoever it is introduc'd, affects the whole Mass of Blood also, disposes it to flow in greater abundance by the *Hypogastrick Vessels*, and not only augments the Lineaments of the *Embryo*, but forms all the other adventitious Substances?

Now if these Particles are capable to do that, if they are capable to affect the whole Mass of Blood without the *Ovum*, and to contribute towards the Production and Encrease of all those other Substances generated at the same Time, for the Nourishment and Conservation of the *Fætus*, why not to be the Instruments or efficient Causes of such Alterations in the *Ovum* it self? And wherefore should we have Recourse to these called *Animalcula*? Will the calling them in for Assistance and Vouchers to what we assert, render the stupendious Work of the Generation of Animals more clear and intelligible? I am afraid not, and whoever shall duly consider what I have here objected against such a Sentiment, will find, that to explain it after that manner, will make it *obscurum per obscurius*.

As I shall not doubt of Mr. *Lewenhock's* Ingenuity, in relating what he has truly observ'd concerning these *Animalcula*, yet I do suspect

I suspect he's a little too earnest to have his Opinion about them confirm'd. If he would have the World believe that the use he ascribes to them is real, then he should have examin'd the Substance in the *Ova Fæminea* in all *Animals*, at least of the same Species, as he has examin'd the *Masculine Seed*, and endeavour'd to discover whether there was *Animalcula* in them also; but he is entirely silent as to that, for which I suspect he has either try'd it, and found there was *Animalcula* there, but had no mind to communicate it, for fear of destroying his Scheme, or being so intent upon the finding of them out in the *Male-Sperm*, he has neglected the other. I'm sorry the first should so much reflect upon his Credit; and I cannot imagine how so curious and diligent an Enquirer after the Structure of the most minute Substances, should have been guilty of the second. For if by his Enquiries he had been enabled to affirm there is no such thing as the *Animalcula* in the *Ovum Fæmineum*, then he could have advanced what was truly convincing; but since there is not one Word of that, and since there have been *Animalcula* observ'd in several other Liquors, as well as in the *Sperma Masculinum*, I must take the Freedom to dissent from him, until more pregnant Proofs be given, especially when I consider that the Substance of the *Ovum Fæmineum* is the *Depositum*, from a Blood of the same Species with that of the

Y *Masculinum,*

Masculinum; and though the Sexes be different, yet the Vessels are so far *Analogous*, as only to transmit Particles much of the same Nature, so that for *Colour, Consistence, Smell*, and all other Accidents, they are scarce distinguishable, the only Difference being in the *Vesicles and Vessels*. For as in some *Plants the Male Farina and Female-Seed* are only prepar'd by their Secretion and Reception into different *Tubuli*, from the same Pedicles in some Flowers, and from the same Juice: In other *Plants Tubuli*, analogous to these, separate or rather receive Particles of the same Nature, by which both *Male-Flowers*, and *Female-Embryones* are compos'd upon different *Pedicles* from the same *Sap*, and in the same *Plant*. 3. Though the *Male-Flowers* be upon different *Plants* in those of the same *Species* which produce the *Female-Embryones*, yet the *Male-Farina* performs the same Office in them, as if the *Male and Female* Parts were upon the same *Pedicle*, and in the same *Flower* of the same *Plant*. Just so, though *Male and Female* be different *Animals* of the same *Species*, yet the same *Seminal Matter* is perform'd or *elaborated* after the same manner in both.

Chymists tell us, that from an *Acidum* and an *Alkali* mix'd together, a *Tertium quid* results, partaking of the Nature of neither. *Tartarus Vitriolatus*, is a *Coagulum*, which neither partakes of the Nature of *Vitriol* nor *Tartar*;

tar; but in this Case, by the Coalition of a certain *Materies* from both *Male* and *Female*, the *Tertium quod* is not of a different, but of the same Nature with both, and is only a Continuation of the same *Species*. An Union of what has proceeded from the other two, so firm, that every thing incident to both Parents, often do's upon certain Occasions exert it self, and is frequently to be observ'd in one and the same Child, as is already declar'd.

I cannot upon this Occasion, but regret the Necessity I am under, of justifying *Nature* it self, and setting the manner of her Operations in a true Light.

Mr. *Morland* has thought fit, not only to embrace Mr. *Lewenhock's* Sentiments concerning the *Animalcula in Semine Masculino*, but has endeavoured to find out somewhat Analogous to them in Plants too, by asserting, that the Seminal Plants are in the *Farina*, and to search after new and unpassable Ways, in order to confirm his Opinion.

It's not without the utmost Reluctancy, that I am forc'd in this Particular to stand up so much in Opposition to one of Mr. *Morland's Character*, and who (I doubt not) deservedly, has gain'd so much the Esteem of Persons of Note and Distinction, because of his Learning, and other Curious and Ingenious Qualifications; but I cannot be so injurious to the Truth, as to conceal what is really Fact. Let any one but view and consider the

Figure he has given of the *yellow Lilly* (*Transact.* No. 287. *Tab.* Fig. 23. p. 1479.) and there they will see how he makes no less than nine *Apices*, supported by *Stamina* as small as Hairs, dance round a *Stylus* hollow at the top, and that all these *Apices* are in height equal to or above the *Stylus*, so that they can pour in their *Farina* into it, as it were into a Funnel; whereas the true Fact is, no *Lilly* has above six *Stamina* proportionally gross, supporting so many *Apices*, which, (as I have said) before the blowing, are near as long as the *Stamina* themselves (1) *Fig. 1. Tab. 1.* and never ascend higher than the Button; and instead of a hollow, or depress'd *Stylus* let any one attend to (1) *Fig. 3.* and there they may see a *Stylus* hollow indeed (*b*), but instead of being depress'd it is pretty much elevated at the top. If this Representation from the Life do's not please, I desire the Reader may satisfy himself in reviewing of the Flowers themselves next Year when they shall be in Season.

Nor has the *Curious, Accurate, and Ingenious* Mr. Bradly fail'd to become obsequious to Mr. Morland's Sentiments, by bestowing not a vegetative, but even an animal and sensitive Life to every *Stamen* of a *Lilly*. (See his *Fig. 1.* to the first Part of the *Improvements of Planting and Gardening, pag. 13.*) where he makes the *Stamen* to arise voluntarily, stretch it self forth beyond the Length any *Stamen* (naturally speaking) ever yet

yet had in a *Lilly*, and to pour down the *Farina* upon a hollow top of a strait *Stylus*; whereas it is for the most part bended upwards, and protuberant (*n.o.*) *Fig. 1.* All I shall say of these worthy Gentlemen is, that they have been resolv'd to make use of an Axiom design'd for another Purpose.

Mihi Res, non me Rebus, submittere conor. I have taken this Opportunity to demonstrate quite the reverse of what Mr. *Morland* contends for; not out of any desire to contradict so Learned Gentlemen, but by making good the Analogy between Plants and Animals, that I may make it appear, if the Seminal Plant cannot be in the *Farina*, no more can the *Animalcula* become a *Fætus*, and therefore if they had contented themselves with going into Dr. *Grew's* and Mr. *Ray's* Sentiments, that the *Farina* is but a *Menstruum* to convey the *prolifick Effluvia* toward the *Vasculum Seminale* or *Semen*, they had improv'd the Doctrine of the *different Sexes of Plants* to a better Advantage, and People would not have been so much amus'd with novel Opinions, which only serve to pervert, and be a Mask to disguise the Truth.

For the Reader's Diversion, I have hereto subjoin'd an *Ode* written in *Latin* in *Camerarius's Epistle de Sexu Plantarum*, and literally translated by a *young Botanick Student*, which as it contains an Abstract of this *Essay*, I have been advis'd to insert.

An ODE formerly Dedicated to *Camerarius* in *Latin*, and now presented to the Author: Being translated into *English* by *J. Martyn*, Φιλο-Βοττανικός.

TO sing new Loves, and new Desires,
Of am'rous Plants, before unheard,
As yet untrac'd by any Bard,
My wond'ring Muse aspires;

You that admire the Lyrick Strain,
And Joys of Venus love to sing,
Give Ear; thy Succours, Flora, bring,
I sing thy flow'ry Reign:

And ye, O Lovers, and ye Herds
Of am'rous Animals, attend;
Your chaste, melodious Voices lend,
You tuneful Choir of Birds.

When Winter's gone, and Spring succeeds,
With gentle Blasts Favonius blows,
The opening Flow'rs each Sex disclose,
And promise future Seeds.

The

*The Stamina with Meal abound,
And when the gentle Zephyrs blow,
They from their double Summits throw
The Golden Dust around.*

*Which born by the propitious Winds,
About the Female Vessels spreads,
And round the Pointal's hollow Beds,
A glad Reception finds.*

*No anxious Thought their Love destroys,
They want no sable Night, to hide
The Blushes of the yielding Bride,
Fill'd with tumultuous Joys.*

*Hither the beauteous Lillies bring,
And the luxuriant Charms disclose,
Of the too soon declining Rose,
The Glory of the Spring.*

*There the Farina we may see,
Down from th'aspiring Summits flow,
The greatest part of Flow'rs we know
Hermaphrodites to be.*

*Now let us leave the flow'ry Plain,
And to the shady Woods retire,
The Catkins of the Nuts admire,
Which pour down sulph'rous Rain:*

*Let us behold the lofty Pine,
That part whereon the Fruit appears,*

*Is Female ; that which Flowers bears
Is Male, both Sexes join ;*

*As Shell-Fish in the briny Main,
At the same Time from one part give,
What with the other they receive,
Both Sexes they contain.*

*Not thus the verdant Laurel fares,
The noble Palm and Juniper,
For on those Trees which Flowers bear,
No shining Fruit appears :*

*And those, upon whose Boughs we find
The Fruit, no tender Flow'r can shew ;
Thus we the different Sexes know,
Of Beasts, and all Mankind.*

*If any farther Doubt appears,
Those, who to jolly Bacchus bow,
The twining Hops with Pleasure know,
Which ease them of their Cares.*

*The Mercury both Sexes shews ;
And Hemp, which pays with double Gains,
The Labours of the weary Swains,
Both Male and Female knows.*

*Thus when her Eggs a Hen conceives,
If the fierce Cock his Female treads,
A living Off-spring then succeeds,
No fruitless Egg she grieves.*

But

*But if her absent Lord she mourns,
A fruitless Egg the Widow bears,
No living Off-spring then appears,
Till her lov'd Spouse returns.*

*So Fish, that haunt the stormy Main,
By bounteous Nature taught, o'erspread
The Female's Eggs with genial Seed,
Nor can the Waves restrain.*

*So when the Pointal's hollow Beds
Are cover'd o'er with Golden Meal,
With growing Fruit the Caverns swell,
And promise future Seeds.*

*On the same Plain each Sex is found,
The ready Wife conceives the Seeds,
When the propitious Zephyr spreads
The gen'rous Dust around.*

*But if the Apex you remove,
Or ravish from the Husband's Arms,
The Virgin Bride's unspotted Charms,
The Flowers will fruitless prove.*

*Sometimes the Female strives in vain,
To form th'abortive Seeds, why should
The double Flowers then be proud,
Since they no Seeds obtain.*

*Oh! with what Joy my Eyes behold
The wond'rous Frame of Nature's Laws!
How*

*How my aspiring Thoughts rejoice,
These Mysteries to unfold!*

*Great Man, thy glorious Theme pursue,
Whilst thee th' attentive World admires;
All other Breasts thy Glory fires,
To trace what former Ages never knew.*

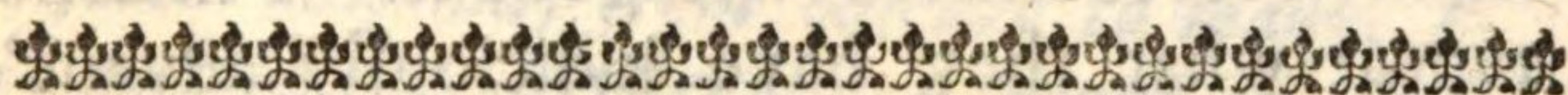
*Almighty God, who did'st the World create,
And from an empty nothing form us all,
Preserve this glorious Order we entreat,
Until the World decays, and Stars from their
(exalted Seats shall fall.*



BOTA-



BOTANICK ESSAYS.



ESSAY V.

Of the Nourishment of Plants.



THE next Branch of the *Analogy* betwixt *Plants* and *Animals*, is their NUTRITION. It may be admir'd how prying and inquisitive Persons should still be so ignorant of the *Circulation* of the *Sap*, or *Nutritive Juice* of *Plants*, if the World had not remain'd ignorant for many Ages of a *Circulation* of the *Blood* in *Animals*, before the famous Dr. *Harvy* discovered it. The great Obstacle I suppose, for finding out the same in
Plants

Plants too, must be the want of a due Consideration of this *Analogy*, the Inconveniency of dissecting the *Succiferous Vessels* in *Plants*; and the *Sap* being of the same Colour with the Vessels, unless it happen sometimes to be *milky* and *white*. The *Celebrated Malpighi*, and the above-nam'd Dr. *Grew*, though they most accurately enquir'd into, and examined the Structure of all the Parts of the Plants, and curiously delineated them, yet they were still deficient in a right Notion of the Motion of the *Sap*, though their Dissections, and Means they us'd to discover the Vessels, are no small In-let to the Knowledge of it. I shall not repeat what they have judiciously advanc'd upon the Subject; for that would be *Cramben bis coctam pergere*, but refer the Reader to their accurate Writings and Figures^a, and proceed to supply what I suppose they have been deficient in, upon the Subject.

I shall therefore first consider the Seed it self, according to the Sentiments of some Ingenious Authors, before it begin to chit or germinate. Its Progress in the Germination, and the Circulation of the Sap after it has chitted, germinated, or budded.

Josephus de Aromatariis, is the first, by what I can understand, who came to the true Knowledge of the *Folia Seminalia* or Seed-

^a Marcel. Malpigh. Anatome Plant. Lond. 1675. Fol.
Dr. Nehemiah Grew, Anatomy of Plants, Lond. 1682.
Fol.

Leaves being pre-existent in the Seed before it was committed to the Ground, which because he has the same Opinion of the Necessity of a Spirituous *Materies* to fecundate the Seed, as *Sennertus*, who I doubt not borrowed it of him, I shall insert an ingenious Letter writ by that accurate and expert *Botanist*, *Paul Boccone*, to *Dr. Tournefort*, upon that Subject. Thus

These, called the Seeds of Plants, are not truly Seeds, neither have they that (Vis, actus & Potentia) prolifick Action, Virtue and Power (as they call it) to generate a Plant. But since this may seem obscure to many, I shall unfold the Mystery: A Plant in due Time generates a fertile Seed, corresponding to the Seeds of Animals, from a certain Materies or Substance, mix'd with spirituous Particles. 2. This is separated in those called Seeds, or (as Empedocles calls them) the Eggs of Trees. 3. The enclosed Spirit in those Places acts more strongly upon the grosser Matter, and always encreasing, subdues the grosser Particles, so that from its principal Part a most minute Plant is truly generated. The Organs being thus determined, this vivifick Effluvium, or Spirit in the Plant, renders them distinct, and proportionally configurated. But it separates the grosser Particles, to be receiv'd as Food by this configurated and fashioned Plant. 4. The little Plant, generated in those called Seeds,

is either begot in that part to which the Pedicle adheres, or an opposite part, or somewhere else. 5. That Part to which the Pedicle adheres, is stretch'd forth in order to compose the Pedicle or Fiber of the Root; from its opposite Part or Top do proceed the Leaves. 6. If it is generated towards the top, the Leaves are stretch'd forth towards the Pedicle, and the Root towards the top. 7. The small Plant, thus generated, lives, is nourished and augmented, and in due Time it decays, and as a super-annuated Animal (as it is called) dies of old Age: 8. Several of these Plants while they remain lurking in the Seed, are nourished by some adherent (as I may call them Umbilical) Vessels. 9. That the Seeds, which contain this, begot or configured Plant, are fecundated; but these, which do not contain it so configured, are barren; nor can they by any Means be rendered fertile. 10. Thus the new Plant grows up and encreases, when put into a convenient Place; but it is not then begot. 11. For the Generation of a Plant is perform'd by Concoction. 12. The Origine of a Plant is, when the Particles are attenuated, and when the Nourishment is concocted. 13. There is a Milk in those called Seeds, provided at the Origine of a Plant, and destin'd for its Nourishment, that it may encrease and augment. 14. The Plant thus begot, receives no more Nourishment, so prepar'd from that which
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is called Seed; but after it falls off from its Mother Plant, it remains in that Condition until it be committed to the Ground, where it may chit and spring forth. 15. Nor do's it receive any more Nourishment by the Umbilical Vessels, but by the Root; for as an Animal is nourished by the Umbilical Vessels in the Uterus, or before the Birth, but when brought forth it is nourished by the Mouth; so those called the Seeds of Plants, receive no more Nourishment after they are ripe, by the Umbilical Vessels or Placenta, but by the Root^a.

Boccone ingenuously acknowledges he had this from a Book called *De Rabie Contagio*, written by the above-named *Josephus de Aromatariis*, and printed at *Venice* 1625.

Dr. Grew is the next who I find has accurately describ'd these *Folia Seminalia* in a *Bean*, which he says consists of three constituent Parts. The *Radicle*, which is observable near to that part call'd the *Eye*, is a white Point, opposite to a small Hole or *Foramen*, which penetrating the common Cover, may be observ'd by the naked *Eye* in a green *Bean*, but more-especially by a Magnifying-Glass it will admit of a small wire. The main *Body* consists of two *Lobes*, which filling up the whole Capacity, are thick and carneous in

^a Boccon. Plant. rarior. Sicil. Observ. 8. p. 61. Edit. Venet. 1697. 4to.

this *Seed*, being closely united and join'd together before the *Germination*. Betwixt these *Lobes* lies a small Substance, crumbl'd and wrap'd up together like a Feather, and therefore Dr. *Grew* calls it the *Plume*. The *Radicle* is the beginning of the *Root*, the *main Body* or two *Lobes*, when afterwards spread forth, become the *Folia Seminalia*, or *Seed-Leaves*, and the *Plume* is the *Rudiment* of the next Pair of *Leaves*, after the *Seed-Leaves* are decay'd. The *Seed* thus compos'd, is inclos'd within two common Membranes, the outer thin, and the inner thicker; and one proper, which covers both the out-side and in-side of the *Lobes*, as also the *Radicle* and *Plume*. The *Plume* do's not appear in several Plants, until the *Seed-Leaves* have been spread forth for some time. Who would be farther satisfy'd about these, may consult Dr. *Grew's* valuable Treatise, called *The Anatomy of Plants*^a. Mr. *Morland* pretends to the Discovery of the *Foramen*, but Dr. *Grew* gave the above Description of it Twenty Years before he wrote. Neither of them have assign'd the true use to it, as shall be shew'd hereafter. The *Fructus Linguiformis*, as *Tournefort* calls it of the *Ash-Tree*, shews the *Radicle* and two *Seed-Lobes* very plainly, if after it has lain a Year in the Ground (for it do's not chit until the

^a Lib. I. Ch. I. Fol. Lond. 1682.

second Season) you strip it of its outer Coat, you may observe the Point of the *Radicle* at the thick End, opposite to the above-nam'd *Foramen*, by which it had communicated with the *Pedicle*. From thence the *Radicle* runs to the other End, where being folded, it is divided into the *two Lobes* which begin there, and return where the *Radicle* began, and there they terminate. Dr. Grew gives a very good Method for finding this *Hole*, which is by steeping the Seed sometime in Water, and then squeezing it, you may observe how the Water flows out of the Hole.

Before I begin to discourse of the *Vegetation* of the *Plants*, it is fit I premise some general Considerations. And, as to the *Elements*, they are, 1. The *Earth*, to which the Seed is committed; this is that which is called by the Chymists *Caput Mortuum*. 'Tis a Composition of stiff or rigid, gross, immoveable, heterogeneous Particles, strictly united, and closely combin'd, incapable to act or perform any thing of it self, unless mix'd with a due Proportion of Water (according to that Axiom of the Chymists, *Salia non saliant nisi in Fluido*) and set in Motion by the heat of the Sun, or some other artificial Heat. 2. Water is a thin, transparent, fluid Substance, whose Particles are so easily separable, that they are soon divided, by which it can insinuate it self into most minute Pores, and penetrate into the most intimate Substances, so that it is capable to extricate and carry along the most

active, volatile, tenuious, and subtile Particles of the *Earth*, and dispose them to be set in Motion. 3. The *Air* is a thin, rarify'd Body, consisting of such tenuious Particles as ascend from the *Earth* and *Water*, and capable of so swift and rapid a Motion, that it can carry every thing that's loose before it; when such Particles as are more Light, are receiv'd into its Body; and such as are more ponderous, and which cannot be suspended by so rarify'd a *Menstruum*, fall down, and return to the *Earth* from whence they came; so that whether we consider the *Earth* simply taken, as a Body of firm, solid Particles closely united, or the *Water*, as having fluid, condens'd Particles, capable to insinuate themselves into the Pores of the former, or the *Air* rarify'd, suspending what is receiv'd as more fit for Motion from the *Earth* or *Water*, we may look upon all these to be most conducive for the Growth and Encrease of Plants.

I have chosen to give this coarse Idea of these three Elements, the better to explain the *Vegetation*, without enquiring, whence this Motion of Particles proceeds? What it is we call the Heat of the Sun? What are the Principles of Gravitation? Why those call'd lighter Bodies ascend, and the more ponderous descend? What is meant by Fluidity, Condensation, Rarefaction, &c.? Whether there be a *Vacuum* or not? Wherein consists the Pressure of the Atmosphere? Why the Pores of Animal and Vegetable Bodies are said to be shut
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in cold, and open in hot Weather? Wherein that which we call Coldness consists? These being Philosophical Questions, do not so properly come in here, where I am to express every thing in the most plain and intelligible manner. I shall only add, That as the three Elements above-nam'd contribute to the Nourishment, Preservation, and Production of all sublunary Beings, so the fourth, which is Fire, is the means of their Destruction, by violently disuniting and disingaging of the Particles formerly combin'd, in which the Dissolution of every thing consists; for as the composure of all kind of Substances depends upon the Union and several Dispositions of the heterogeneous Particles, and different Configurations of their Pores, so whatever is instrumental in dissolving of this Union, tends to the Destruction of the Body. And as that which we call Cold depends upon a more than ordinary *Quies* of all the Particles, so their being set in a mild and slow Motion, gives the Idea of *Warmness*; and when they are mov'd more quickly, or in a more intense Degree then we feel that which is called *Heat*: Whereas when the Particles are mov'd and agitated in the most vehement, rapid and intense Degree then that which is call'd *Fire* is produc'd. And whereas it tends to the Destruction of Bodies, so the other two, *viz.* *Heat* and *Warmness*, cherish and enliven them. It is also in a smooth and pleasant Motion of Particles that *Life*,

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and

and in an intire Cessation of this Motion, that *Death* consists.

2. I shall not descend to the particular Consideration of the Particles themselves, nor condescend upon their different Figures. Neither shall I endeavour to determine the Configuration of the Pores or Interstices betwixt them. I need not have Recourse to the *Chymical Principles*, nor offer to sum up all the various *Oils, Salts, Phlegms, Spirits, Sulphurs, Nitres, Acids, Alkali's, &c.* which are suppos'd to enter into the Composition of that Variety of Animals and Vegetables that are upon the Earth, nor explain whence this diversity of *Tastes*, such as *bitter, sweet, salt, hot, acrimonious, &c.* proceeds, any otherwise than to suppose they are the Effects of the several Particles so and so combin'd, which variously affecting our *Tongue* and *Palate*, afford us the different Idea's of these several *Tastes*.

In a word, As the *Materies Mundi* consists of an unconceivable Variety of differently configurated *Particles*, so all the various Substances which make up the Fabrick of this *Earthly Globe*, and whatever corpuscular Beings are either in, or upon it, seem only to depend upon their different Combinations, and different Proportion, according to their several Configurations, by which their Pores and Interstices must be so fram'd, as only to admit of Particles of such a Figure, as they may enter into other Pores of the like Configuration ;

guration; and being thus adapted to Particles of that same Figure, they serve to extend and augment the *Bodies* of such and such a Composition and Texture. Thus we see in a Bed of Earth or Mold, prepar'd and dress'd up according to the Art of the *Gardiner*; if there be a handful of several Sorts of Seeds sown in it, every *Species* of them shall chit, and become a Plant, all which shall be of different *Genera*, *Species*, *Tastes*, *Virtues*, &c. and yet proceed from the same Earth; and the Reason is plain, because the Pores of their Roots being certain minute Cavities, circumscrib'd by the several Particles of such and such Figures, they can admit of no other into their Capacity, but such as are of the like Configuration. When these Things are duely consider'd, there will be no need of having recourse to *Suction*, *Attraction*, *Fermentation*, *Concoction*, *Digestion*, &c. For there is nothing more requir'd here in a *Plant*, than that it be plac'd in Ground suitably prepar'd, and in an agreeable Soil; that it have convenient Depth in the Earth, and a sufficient Space to extend the Fibers of its Root; and then, as the Particles ascend, being set in Motion by a seasonable Heat, they enter the Pores of the Root capable to receive them; and thus they encrease and augment the *totum Compositum* of the *Plant*; and this is no more than the accidental intercepting of such Particles, which otherwise might have escap'd into the open Air.

This being a very easy and natural Basis upon which the Vegetation of Plants, hitherto look'd upon as so difficult, may be founded, I hope to explain all the different *Phænomena* which can be reasonably propos'd by the same.

As in the last *Essay*, I explain'd the Manner of preparing the *Farina*, until it was ripe, and capable to *fecundate* the *Seed*: Now I come to the Preparation of the *Seed* it self. All *Seeds*, as *Josephus de Aromatariis* well observes, have an *Umbilical-Vessel* or *Placenta* to nourish them from their first Formation till they be ripe. These *Placentæ* are either common to a great many, or proper to every single *Seed*, not but that in these common *Placentæ*, each *Seed* has the Orifice of a Vessel peculiar to it; but they are more closely join'd together in the common, and more distinct and farther separated from each other in those I call proper *Placentæ*, v. g. In the *Papaver Capitatum*, or *Garden-Poppy*, there are several *Laminæ*, which arising from the Sides of the *Capsula*, and running towards the Center, have the *Seeds* thick set in each Side, as it were indented or fix'd in them, as the *Teeth* are in the *Jaw per Gomphosin*, as the *Anatomists* call it; and here is a wonderful Contrivance for the Preparation or Percolation of the Particles of which the small *Seeds* are to be compos'd. The milky Sap flows in great Abundance up to the Pedicle. At the
Articulation

Articulation below the *Capsula* or Head, it is receiv'd into a great Variety of small parallel *Tubuli*: These ascending along the side of the *Capsula*, disperse the Sap into every one of the different *Placentæ*. These are again subdivided into a great Number of yet smaller *Tubuli*, which run directly to the particular *Semina*, so that it is easy to suppose this Seed must be the very Quintessence of the whole Plant, when the Sap, which nourish'd it must have pass'd so many different Channels before it could arrive at it. How fine and delicate must these *Tubuli* be which must pass through the minute Pores of the *Seed*, frame the *Radicule*, two fine, small *Seed-Leaves*, and the common *Tunicle*? How admirably is the *Pedicle* articulated with this Head, which will no wise separate from it until all the Seeds be fill'd? For the *Stalk* will rather break by Force than the Head can be pull'd from the *Pedicle* by the Articulation, before the Seeds are ripe. This is exactly analogous to the *Placenta* in *Animals*, for so soon as the *Ovum* has drop'd into the *Uterus*, then this adventitious *Placenta* and *Navel-String* begin to be fram'd by an Elongation of the *Capillaries* of the *Hypogastrick Arteries* in the *Uterus*, where it forms the *Capillary* Extremities of the *Arteria Umbilicalis*, which conveys the Blood to the *Fætus*; but no sooner do's the determinate Time of the *Birth* approach, than these *Capillaries* pleasantly separate from each other

without any extraordinary flooding: Whereas at an *Abortion*, or an *untimely Birth*, this flooding is usually extraordinary, and the Vessels are, as it were, torn from each other. Thus the Seeds so soon as they are fill'd and ripe, quit their hold of the *Placenta*, as a Leech falls down from the Orifice it had made in the Skin, when it is glutted with Blood, or as the Navel-String of most Animals, Quadrupeds especially, drops of its own accord when the *Fætus* is brought forth. This is more observable in large Seeds, which have separate *Placentæ*; such as *Peas*, *Beans*, *Phaseoli*, &c. where there is, as it were, a common *Navel-String* running from the *Pedicle* to the point of the long *Siliqua* or *Pod*, and at every certain Distance there is a small Production or *Placenta* for the Nourishment of each *Seed*. This *Placenta* is proportionably large enough, and adherent to the Eye of the *Bean* or *Pea*, by a certain Viscosity, and sends forth two Kinds of Vessels, the one to nourish the common *Tunicles*, which being distinct from the Seed it self, is not nourish'd by one and the same *Vessel*; for that which nourishes the Seed is an Elongation of the *Placenta*, which penetrating the common *Tunicle*, by the above-named *Foramen*, terminates in the point of the *Radicle*, which from thence conveys the Nourishment throughout the *Lobes* and *main Body* of the *Seed*, and what is superfluous returns by the venal Duct

Duct to the *Placenta*. In naked, whether they be *Polyspermous* or *Monospermous*, *Seeds*, each has a particular *Placenta* from the *Pedicle*. This Elongation of the *Placenta* through the *Foramen* is obvious in the *Monocarpi*, as in the fore-named *Ash-key*, where the Point of the *Radicle* is no other than the broken Extremity of that Vessel of the *Pedicle* which nourished the *Seed*, being continued through the Perforation of the *Outer Coat*. This affords us a pleasant Speculation of the wonderful Providence of Almighty God, that one Species should be as it were, only a Continuation of the other; for the Seed at this Rate, is no more than a detach'd *Germen* or Bud of the Tree, which being fram'd by, is nourish'd along with it, as being *Bone of its Bone, and Flesh of its Flesh*, until it has acquir'd a convenient Bigness, and can purchase Food for it self, being sufficiently provided with a *Mouth*.

This renders the Idea of the Chitting or Germination of the Seed very easy. Here we see a Plant already form'd, having Root and Leaves, which as *Sennertus* well observes, after it is detach'd from the Mother Plant, is capable to subsist of it self, without fading, being cover'd with, as it were, a Coat of Mail, or sufficient Armour to guard and defend it, whereas no other part, being pull'd from the Plant, do's so, but dies immediately when it is committed to the Ground. Al-
though

though it die from being a Seed, yet it lives to become a Plant; and that very Vessel by which it received Nourishment from the Mother-Plant, is now employ'd to receive it in like manner from the Earth; for the Point of the *Radicle* is no other than the broken Orifice of the *Pedicle* or *Placenta* of the Mother-Plant. And now the Particles in the *Seminal Plant* being set in Motion by the Subterraneous Heat or Warmth, this Orifice is dilated and rendred capable to receive an additional Supply of new Particles from the *Earth*. This *Foramen* is here of special Use, for the nutritive Particles in their ascent have free access to the Orifice of the *Radicle*, they having once begun to flow, one Particle is succeeded by another, until they reach the Reduplication of the *Radicle* where the two *Lobes* are form'd, whence they pass to their Extremity; where being confin'd by the common Tunicles of the Seed, they form new Channells, by which they return with greater Force, being continually follow'd by a new Succession of Particles; so that several of them being impacted in the Interstices, betwixt those which formerly compos'd the *Radicle*, it is by this Means stretch'd forth; and being at greater Freedom, dilates the *Foramen*, and is extended far beyond it. When these *Particles* have arriv'd at the thus stretch'd forth Extremity, they frame new *Vessels*, by which they return again to the Extremity of

of the two *Lobes*; and thus, by the reciprocal Progress and Regress, they stretch forth the *Radicle* on the one hand, perhaps two or three Inches, and enlarge the two *Lobes* so far on the other, that the outer Coat not being able to contain them any longer, they burst and fall off; and thus the *Folia Seminalia* lift up the Head, extend themselves, and appear above Ground.

And here the special Use of this *Foramen* appears. “ There is no Necessity of any
“ airy Particles which may obtain an Entry
“ through this Hole to excite a Fermentati-
“ on, or for any such Particles or Steams which
“ might damp the genuine Proceeding of it
“ to pass out that way, as Dr. *Grew* would
“ have them. Neither is this Hole so situated as to admit of the *Seminal Plant* from the *Farina*, for I have already shew’d how unaccessable it is for it to enter the Seeds of the filiquous Plants, and Mr. *Morland* must have a strange Idea of it, when he makes this *Seminal Plant* to be a distinct Body, from the two *Lobes* of the *Bean* already form’d; and at its full Bigness, as in Fig. 26 of the before-cited *Transaction*. Sure if he had consulted Dr. *Grew*’s Dissection of the *Bean*, and even the Dictates of Nature it self, he would never have ordered such a Figure to be delineated: Nor do I see what he can mean by such a Representation of a *Papylonaceous Flower*.
Fig. 24. Dr. *Grew* speaks of an inner Body,
which

which is one entire Body in a good part of the *Radicle*, towards its *Base* : That it is divided into three main Bodies, the middle running directly to the *Plume*, the other two on each side passing to the *Lobes*. For my part, as I am loath to gainsay so accurate an Inspector into the Structure of the several Parts of the Plant, so I see no great Necessity for establishing this inner Body ; for as I am convinc'd that the Juice at the beginning may circulate several Times betwixt the *Radicle* and the *Lobes*, until the Particles are sufficiently attenuated and prepar'd by passing through the several *Capillaries* : So when this is done, they tend no more laterally, but ascending perpendicularly in the Center, as the most attenuat Particles of all Liquors do, by degrees it stretches forth and extends the *Plume*, until the two *Leaves*, of which it is compos'd, are fully expanded. From henceforth the Sap taking a perpendicular Course in its Ascent, and forsaking its former Road, the *Lobes* or *Seed-Leaves*, decay apace, as these of the *Plume* are augmented, until the one is withered away and dies, while the other pushes forth a Stalk directly from the middle, betwixt them. That this may be the use of these *Seed Leaves*, is very evident ; for, if after the *Plume* has appear'd, and while the *Seed-Leaves* are yet strong and juicy, you shall tear them off, the *Plume* in the middle will decay ; whereas, if they are allow'd to remain, when the *Plume* is

is become strong, they fall off of themselves.

Thus we may easily consider the Progress of the Seeds in the several Steps of their *Vegetation*, viz. How this Point of the *Radicle* receives its Nourishment by the Orifice of the broken Extremity of the *Pedicle* or *Placenta* formerly contracted, now dilated. How the *Seed-Leaves* come to be extended? And how by a daily receiving of a new Supply of Particles continually circulating in their proper Vessels; first the *Radicle*, then the *Folia Seminalia*, are extended and augmented in their Turns, until the *Plume* is expanded and becomes strong; after which these *Seed-Leaves* fall off. So that now the Circulation is continu'd from the *Root* to the bottom Leaves and Stalk, from thence to the Root again, where, by a reciprocal Circulation, these two are extended and augmented in their Turns; and when the *Root* is enlarg'd in its Capacity, then the *Orifices* which receive the nutritive Particles, encrease in their Number. For as in the Nipple of a *Woman's Breast*, the Milk flows out by different Streams from the *Tubuli Lactiferi*, so here by several *Tubuli* is the *Sap* admitted. This Admission, Reception, and continual *Circulation* of the nutritive Particles seems to be so very easy and natural to conceive, that I cannot but admire, how, having so fair an Example as that of the *Circulation* of the *Blood* in *Animals* before them,

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this

this should have lain so long in the Dark, and hid even from Persons of great Penetration? How much the want of the due Consideration of it has puzzled them, rack'd their Wits, made them run into absurd Notions, and entertain such strange and wonderful Idea's of the Vegetation, is sufficiently to be seen in their elaborate Writings.

Since its plain, that there is a natural and continual ascent of Particles from the Earth: If there is a Pore in the Extremity of the Fiber of the *Root* of a *Plant* perpendicularly situated above the Place where they ascend, is it not as natural to conceive a Particle may enter, where, by a *Tubulus* leading steightway from this Pore, it may ascend freely, as to suppose that those Particles which lie deeper *in gremio Terræ*, do by the Heat of the Sun gradually ascend towards the Surface of the Earth? If there is access to one Particle, we may believe there is also access to others succeeding it, which continue to follow the same Path so long as there remain any perpendicularly below, which can have easy Admission into such a Pore. If again, instead of one Extremity of a Fiber we are to suppose 1000, 10000, and so on in some Plants, and that the *Tubuli* from these Pores or Orifices do all unite and join together, in order to compose one or more Trunks of Vessels, it is easy to imagine, how by the continual Accretion and Succession of these Particles, at Length a Liquor may be form'd,

form'd, capable to fill up and possess all the different Channels of the Plant, until it arrive at the Extremities, where these Trunks are again divided and subdivided into smaller *Tubuli*, until they come to a *ne plus ultra*. And since we may suppose these Pores may be pretty patent and open at the Root, where gross, crude, undigested Particles may enter, whence flowing into larger and larger Capacities, they cannot as yet be rendred so tenuious as to pass into the most minute *Tubuli* of the fine Pedicles and Flowers: Therefore, without having Recourse to *Concoction*, *Digestion*, or *Fermentation*, we need no more than to suppose them first to ascend, then to be forc'd up by a continual Succession of following Particles, until they come to the fore-said *Angustia*, that they must enter the narrow Channels, or else stagnate or hesitate there. It is easy to suppose, how by rubbing against the stiff sides of the Pores, and narrow *Tubuli* through which they are to pass, they may be sufficiently attenuated, rendred more and more subtil, and made capable of being admitted into the finest *Capillaries*; and if any of them by this Friction, are so attenuated that they cannot be well adapted to the Pores at the sides of the *Tubuli*, to contribute towards the Accretion and Growth of the Plant, these pass out at the Extremities, and flow into the common Air; such of them as can be receiv'd into the Pores betwixt two Particles of the solid Sub-

stance remain there; and these that still continue to be too gross, return, in order to be mounted again in their Course by another Circulation. And thus the vegetable, as well as animal Bodies, are augmented, and do encrease, the one by a continual, *uninterrupted Circulation* of the *Sap*, as the other of the Blood throughout the several Vessels, and *nutritive Tubuli*.

I am next to consider the different Substances of Plants. They are either Herbaceous, or Ligneous and Woody. The Herbaceous consist for the most part only of two Substances, the *Parenchyma* and Marrow, and sometimes they have no Marrow at all, but are only hollow. This *Parenchyma* of the Herb consists of the same loose Texture of parallel *Tubuli*, endow'd with several large open Pores tending horizontally, or inclining outward, as the *Bark* of *Trees*, and is only covered with a very thin, extended, membranous Substance without, as the *Cuticula* covers the Skin in humane Bodies. Here the *Sap* ascends with the greater Freedom, and in greater Abundance. Hence it is that such Plants, generally speaking, have their flowering Time, and the Time of perfecting and ripening their Fruit and Seed in one Season. After which the whole Surface, *i. e.* Stalk and Leaves, die immediately. If the Root which becomes hard and woody towards the latter end of the Season, dies too, then it is called an

an annual Plant, and is no wise propagated but from the Seed. In others the Surface only withers and decays, and the Root remains lively and carneous, and then it is called a perennial Plant. The part whence the Stalk arose in these is shut, and as it were block'd up, so that nothing proceeds from thence any more ; But new Buds arise in the *Autumn*, (as the ascent of the Sap by the former Stalk ceases) which are augmented and become stronger, by the framing of a Course of new parallel *Tubuli*, by the continual ascent of the Sap towards it, and by the return of the Sap it self towards the Root. So that by a reciprocal Circulation these new *Tubuli* are prepar'd and augmented, and the Bud is dispos'd to push forth new Shoots in the Spring: And whereas there arose but one Stem the first, sometimes there will be two, three, or four next Year, and so on, as may be seen in the *Bryony*, &c.

In the annual Plants, some have a fibrous Root : These do generally prepare very soon for the Stalk, in order to which, after the *Radicule*, which is long and small, has stretch'd it self two, three, or four Inches perpendicularly downwards. Then it emits a great many small Fibers obliquely round it, that it may receive the nutritive Particles every where from the Circumference, and convey them to the Center ; whence ascending perpendicularly, it stretches forth a few bottom Leaves;

and the superfluous Sap returns to the Formation of more Fibers. Thus the Sap continues to ascend and descend for the space of two or three Weeks, the Stalk mounting but little all this while, and the greatest Provision being made for the Fibers of the Root. For as the first Work of the *Bee* is to form the Honey-Comb, or those Caverns in which the Honey is to be lodg'd: So in the Vegetation of the Plants, the first Step is the Formation of the nutritive *Tubuli*, and fibrous Receptacles; and the bottom Leaves in this Case, are like the circulatory Vessels, which the *Chymists* use, when fixing one *Matras* upon another, and placing it in a Sand-Furnace, they make the Liquor to ascend by a gentle Heat to the top, from whence it returns to the bottom, and by its circulating after this manner for some time, the Tincture is extracted from harder and more compact Bodies. So here the Plant does not arise to any height, until by frequent Circulations from the Root to the Leaves, and from the Leaves to the Root, the Sap already entered be better prepar'd, and convenient Vessels be form'd for the Admission of more. The *Corona Solis*, or Sun Flower, is a pregnant Example, where from one pretty large Seed, being for the most part $\frac{2}{3}$ of a Grain Weight, the Seed-Leaves being gone, the bottom Leaves augment in their Number by Degrees, and encrease in their Bigness for the Space of two Months, while the Fibers of the Root are a

forming, and Provision is making for a larger Quantity of the Sap. And as there will not all this Time be above four or six Leaves upon the Surface of the Plant above Ground; so there will be a vast Number of Fibers struck out below. And here is a pregnant Proof of the Circulation of the Sap, from the different Position of the Fibers of the Root, from the Pedicles of the Leaves, and Branches of the Stalk; for whereas in the Root, all the Fibers descend obliquely from the principal Trunk, no sooner is the Surface above Ground form'd, than the Pedicles, Stalks and Leaves ascend, which must needs proceed thus: When the Sap is receiv'd from the Earth, it ascends and pushes out the upper Surface. What is superfluous returns, and from the Parallel *Tubuli* in the Center of the Root, tends laterally, and frames new Channels, which are still more stretch'd forth, according to the Proportion of the Sap; for we are not to suppose that so soon as the nutritive Particles are receiv'd at the Extremity of the Fiber, and admitted into the *Tubuli*, which compose the principal Trunk, they should immediately form an Angle, and descend streightway towards the Earth again, stretching forth the Fiber of the Root all along as it passes; but its more easy to conceive, that after the Sap has ascended towards the Surface and Extremities of the Leaves, Stalk and Branches, it returns more speedily, and with greater Force, for *Facilis Descensus Averni*, and consequently

when it comes to the Root, tends laterally, and frames the obliquely descendent Fibers.

In the *Carneous* or Parenchymatous *Roots* of those called *Annual*, though generally speaking they are biennial Plants (for one Season is spent in the Formation of the Root, and the second Season in Perfection of the Seed, and then they decay) though some of them, as the Radishes, both form the Root and produce the Seed in one Season: In these, I say, the case seems to be different, for they make all the Haste and Provision they can to frame the Root first, only by pushing out some bottom Leaves, for the more regular Performance of the Circulation. The manner of their growing I take to be thus: The Point of their *Radicle* is at first pretty large, and capable to receive a good deal of Sap, and of Particles pretty gross, the more subtile ascending perpendicularly, go towards the Nourishment of the Surface, while the more gross and aqueous tend laterally, and form the *Parenchyma* or carneous Substance of the Root. The nutritive *Tubuli* in their Ascent, form an Arch, and are bended inwards, and descend again without entring the Surface; and thus continuing by Degrees, till the more subtile Particles of this lateral Sap, in its Descent, approaching nearer the Center, when perhaps, after their second or third Circulation, they are receiv'd into

into the parallel *Tubuli*, which convey them strait towards the Surface. This is very easily demonstrable in a Turnip, where 'tis generally observ'd, that the biggest Root has the least Top; and where contrary to most of other Parenchymatous Roots, the carneous Substance is more spongy, less subtile and waterish, and the Bark of a much firmer Texture and hotter Taste. The encrease of this Turnip Root in a short Time is such, that if it were not avouch'd by Persons of good Credit and Reputation, it would seem incredible. The *Reverend and Learned Dr. Desaguliers*, R.S.S. so famous for his intimate Knowledge in the *Experimental Philosophy*, lately communicated to the *Royal Society* some wonderful Examples of this Nature, *viz.* Turnip-Seed, sown *July 2. 1702*, appear'd above Ground in three Days. On *August 12*, a large Turnip, and probably not the biggest in the Ground, at the end of six Weeks weighed two Pound fourteen Ounces. There were 1000 Grains in an Ounce of the Seed. By his Calculation, one of these Seeds encreas'd 671600 Times its own Weight in six *Weeks* Time, 111933 $\frac{3}{4}$ in one *Week*, 15990 $\frac{1}{2}$ in one *Day*, 666 $\frac{1}{4}$ in every *Hour*, and eleven Times its own Weight every *Minute* of an *Hour*. Another Turnip pluck'd up *October 21*, weigh'd 10 Pound and a half, which upon Calculation was found to weigh fifteen Times the Seeds Weight in every Minute, from the Sowing to the draw-

ing of it^a. By this one may consider what a Torrent of Sap has flow'd in at this one Extremity of the Root, and what haste it made in the circulating, to remain within the Root it self, so as to form the *Parenchyma*, without ascending higher.

As this Plant is dispos'd to form the Root first, so there are other biennial Plants which first form the Leaves, and extend them to the full Length, before the Root has much encreas'd, v. g. In the Onion the Tubulous Leaves grow and encrease first, for the *Gardeners* usually trample them down towards the end of the Season, in order to dispose the *Onions* to grow. And here again the *Sap* has a distinct Circulation in the *Root*, beside that which is common both to *Root* and *Plant*; for each of the lateral *Squamae*, of which the Bulb is compos'd, have their distinct *Tubuli*, discernible almost by the naked Eye, in which there is an Ascent and Descent of the Sap proper to the *Squama* it self, though I shall not deny but there may be an Intercourse of Fibers at the sessile Part, and that the Sap which ascends one *Squama* at one Time, may be receiv'd after its return, by the *Tubuli* of another *Squama*, and afterwards may ascend the Plant it self; by which we have still the more Reason to contemplate the wonderful Works of Almighty God, who so orders and disposes

^a Philosoph. Transact. No. 360. p. 974.

of all Things, that there should be an exact Symmetry in, and intimate Communication, Commerce, and Correspondence among all the Parts of the several compounded Bodies throughout the World.

Nor is this distinct Circulation in the *Root* from the other Parts of the Plant peculiar to Plants alone. It is so in several Parts of the *Animal Body* also. In the *Heart*, the *Arteria Coronaria* makes a short Tour throughout its *Parenchyma*, and soon returns by the Vein of that Name. In the *Abdomen*, the *Cæliack* and *Mesenterical Arteries* soon empty themselves in the *Vena Porta*, the Blood in it is soon dispatch'd to the *Liver*, from thence sent immediately back by the *Vena Cava* to the *Heart*. The *Intercostal Arteries* in the *Thorax*, empty themselves into the Veins of the same Name, which soon return the Blood towards the *Heart* by the *Vena Azygos*.

This extraordinary Admission of nutritive Particles, is no more surprizing in the Roots below Ground, than it is sometimes to annual Plants above Ground; for in the Roots there is scarce any exhausting of the Particles which pass out to the common Air. Whereas in several Plants, what passes through the Pores may be reasonably suppos'd to exceed that in Quantity which remains within the Vessels, and circulates throughout the whole Plant, *v. g.* In Presence of the Celebrated Dr. *Halley*, R. S. Secr. I took up a Plant of the *Flos*

Solis, which was nine Foot high, the Weight was nine Pound; the principal Stalk was five Inches in Circumference, and one of the Heads was seven Inches in Diameter. Upon removing the Earth we found the Root, consisting of a vast quantity of small Fibers, which was one Foot Diameter, from the Points of the Fibres on the one side, to those of the other. They had descended obliquely six Inches in the Ground. We could not make an exact Calculation of its daily encrease, because we could not be justly inform'd of the precise Time the Seed was planted; but by a modest Computation, Dr. *Halley* was of Opinion it might augment about one Ounce in a Day of its Weight. If so, then I have Reason to suppose it might receive at least $\frac{2}{3}$ more of Particles from the Earth, which had evaporated into the Air; and the Reason of my Conjecture is, that upon the 25th of the Month of *September*, about 9 a-Clock in the Morning, I took up in the same Garden where the *Sun-Flower* grew, a Plant of *Nicotiana* or *Tobacco*, in its full Vigour, when most of the Flowers had blown, and several of the *Capsulae* were full of Seed. This Plant was also nine Foot high, its Weight six Pound and a quarter. Here the *Roots* were not so full of small Fibres, but upon the transplanting of it, the principal Root had been bended, and there had another sprung from it of the same Bigness; each of them were about the Bigness

ness of the Thumb ; these took up a large Surface of the Earth, for there was three Foot betwixt the opposite Extremities of these larger Roots, beside several others. I was inform'd it might have been five Months from its first sowing, which is not so very sudden an Augmentation, though the Seed being one of the smallest that can be thought of, to be perceptible ; 'tis a prodigious Enlargement in the Bigness, for one of the largest Leaves was 21 Inches long. Being willing to have an Idea of what it might exhaust in a Day, or whether it would live any Time out of the Ground, as the succulent Plants do, I took special care not to break any of the Fibers in taking up the Plant, I chose a dusky Morning, when it neither rain'd, nor was it warm or dry Weather. I carefully plac'd it among several Plants where the Sun-Beams could not reach its *Root*. On the *Monday* following, being *September* 28, at the same Hour, finding the Leaves very much faded, I weighed it again, and found it lost two Pound and a half in seventy two Hours, for its Weight was then three Pound three quarters. It might have been easy to calculate both the Quantity of the Sap admitted, its daily *Dispendium*, and what remain'd had a Computation been made of its daily encrease as to its Bigness.

I only mention these, to shew there's an insensible *Transpiration* in *Plants* as well as *Animals* ; that the Pores of some *Plants* are

are more open, and others more shut, and that some *Plants* may have a more volatile Sap than others, which will be of use here after in explaining of some *Phænomena*. And I look upon such a Computation as this to be of moment, both for the better understanding of the *Vegetation*, and to direct how to place *Plants* in a convenient Soil; for the insensible Transpiration is more regular in *Plants* than in *Animals*: And if the *Statics* enabled *Sanctorius* to make so just a Calculation of the Transpiration in humane Bodies, and which the *late Learned Dr. James Keyl* so handsomely improv'd here in *Britain*, certainly if any would be at the Pains, they might be of moment if the Experiment were try'd carefully in *Plants* too, not by confining them to a Pot, as is usually done, but by sowing the Seed in a convenient Soil, considering the Time it lay under Ground, its daily Encrease after the Plant appear'd above Ground, both as to the lengthening of the Stalk, the daily Augmentation and Number of the Leaves and Branches, and every now and then taking up a Plant of such a Bigness, of the same Species and the same Soil, and weighing it, and letting it have all the Freedom of well-prepar'd and deep Earth, Air, Water, Heat, Damps, Dews and Sun-shine. By this one may come to know, not only the daily Proportion of the Plant in its Bigness and Weight, but also its proper soil, by trying several

veral of them in different Soils, and have an Idea of the Prevalency of their Virtues, by considering the Place in which they grew, which though little thought of, is much wanted. This is a much more natural way than that of weighing the Earth in a Pot, measuring the Water, &c. for by so doing it is impossible to know the natural Growth and Encrease of a Plant, v. g. The *Sun-Flower* which amounted to nine Pound Weight, did only occupy one Foot Diameter of the Surface of the Earth. *Nicotania*, which weighed six Pound and a quarter, spread forth its Roots so far that the opposite Extremities of some of them were at three Foot Distance. At this rate a *Sun-Flower* may chance to grow in a Pot and acquire its natural Bigness, provided it have depth enough of suitable Earth, whereas the *Nicotiana* would be so confin'd within a Pot of the same Bigness with that of the *Sun-Flower*, that we cannot suppose it would be so large, nor grow so high. And in this case too it were not inconvenient to take two Plants of each, of the same Weight and Bigness, from the same Seed-Bed; plant the one so as it may grow at its full Freedom in the Earth; and let the other be plac'd in a due Proportion of Earth, in a Pot, by which it may be observ'd which has the Advantage in the Encrease and Weight; for I am of Opinion, nothing that is constrain'd or forc'd can let us have any true Idea of the Vegetation of Plants.

I thought fit to propose these Methods of trying Experiments to the Curious, not having an Opportunity to do it my self, because there may be a juster Calculation of the Vegetation by the *Statics* in *Plants*, than in *Animals*.

For in *Animals* there are to be considered the *Res Naturales*, as the *Cibus*, *Potus*, *Excrementa*, *Retenta*, *Quies*, *Motus*, *Animi Pathemata*. The *Cibus*, *Potus*, are to be considered both as to the Quantity, which is easy to be done by weighing; but then the Quality may alter, v. g. The Meat may be more or less solid, and more or less easy to digest. The Drink may be more or less spirituous, by all which the Perspiration may be more or less promoted; for the *Excrementa*, the *Fæces Alvi*, the *Urine*, and *Saliva* must be justly calculated, in order to make a Computation of the Perspiration; for the *Quies*, the *Sleep* and Rest of all the Blood and Humours which then move pleasantly, the Quantity perspir'd at such and such a Time, may be more easily computed; but then is to be considered the Time of going to Rest, whether after a full or empty Stomach, whether after a *Crapula* too much Liquor, or after having moderately drank; whether a Fatigue, or moderate Exercise; whether after the Person has sweated by abundance of Bed Cloaths, or if he has lain cool; and lastly, the *Passions* and *Affections* of the *Mind*, such as violent Transports by passionate Wrath and Anger, serious Reading and Thinking,

Thinking, which also exhausts the Spirits; excess of *Joy* and *Gladness*, and *Deepness* of *Melancholy*, *Grief* and *Sorrow*. All these, I say, may make the Transpiration in our Body variable, according to Circumstances and different Exigencies in a humane Life. But for Plants, if they are plac'd in a convenient Soil, and live in a suitable Season, it is more easy to calculate their Perspiration, for it is always in Proportion to the same Bigness in Plants of the same Species, the only Difference depending upon the Weather and Time of the Day, according to the different Pressure of the Atmosphere, and as the Pores are more open or shut; for as to Exercise, the Plants are always in a *Quies*, unless they be sometimes more than ordinarily shak'd by the Wind. And as to their Nourishment, they always receive that in a due Proportion, according to the Goodness or Badness of the Soil. They have no Sickness of Stomach nor loathing of Appetite to deny their Food; no Fever, nor any other Distemper to disable them from receiving it, nor any excrementitious Secretion to exhaust their Nourishment more than what is convenient; and therefore, as it is easy to consider by the Surface of the Earth, and the Quantity of the Roots in it, how a Plant may encrease to such a Bigness, in such a Time, so we are able to make a Calculation of the Proportion in what the Plant transpires, with what it receives, but of this more hereafter.

I

I come next to consider the manner of Vegetation of the Trees, and so I shall compare the Motion of the Sap in Plants, with that of the Blood in Animals, and with Mr. *Bradley* compare the Tubes *which convey the Sap upwards to Arteries, and the Passages and Pipes by which the Sap retires downwards to the Veins.* 2. In Animals the Food is taken in at the Mouth, digested and prepar'd in the Stomach. The excrementitious Matter is separated from it in the Intestines. The Chyle or milky Juice, is from thence, by proper Vessels, convey'd to the Heart; from thence having paid a Visit to the Lungs, where by the Pressure of the Air it is the better prepar'd to undergo a future Circulation. After its return to the left Ventricle of the Heart, it is forcibly beat out thence, and compell'd to move towards the Extremities, where passing through all the minute and small *Capillaries*, it returns by the Veins to the Heart; and thus, by successive Circulation, the crude, chylous Particles are better digested, the more gross farther attenuated, and all the Mass of Blood is enabled to undergo the several *Vegetative* and *Animal Functions* requir'd by it. But in Plants there is no farther Preparation than a mere Reception of the Particles by the Pores in the Extremities of the *Radicle Fibres*. They are first set in Motion by the Heat, and forced up by a continual Succession of those that follow, till they arrive at the Extremities; from

from whence they return by the venal Ducts; so that whether in a Vapour or a Liquor, if one Particle be receiv'd into the most minute Pore or Fiber, and the other to which the same degree of Motion is conciliated, follow it as it were close at the Heels, there being no mean of stepping aside, the one must of necessity press the other upwards; and when they are arriv'd at the Extremities, as we cannot suppose all the Particles must either pass out at the Pores in the Perspiration, or be impacted betwixt the solid Particles already in a *Quies*, thereby to contribute to the Growth and Encrease of the Plant; so some of it must return of Course; and if this be granted, as it seems to me undeniable, what should hinder a continual, uninterrupted Succession of Particles, and Circulation of the Sap, of which they are compos'd, throughout all the Seasons of the Year, as well in Herbs as Trees, without either being stop'd or condens'd in the Winter, or rendred more fluid in Summer, as some have imagin'd? But of this more hereafter.

The next thing to be consider'd is, how these so very different Substances shall be form'd, from Particles proceeding from one and the same Earth, and in one and the same Tree. As Bread and Water can sustain the vegetative Life of a Man, though perhaps such a way of living may not prove so comfortable to him; and as Hay and Oats, or perhaps Oat-Straw, and the Oats themselves, both being the Product
of

of the same Plant, can nourish a Horse ; and as from such seeming homogenious Substances, the several dissimular Parts of the Body, as they are called, such as *Skin, Flesh, Bones, Cartilages, Membranes, Blood-Vessels, Nerves, &c.* can be form'd, so we may conceive the *Bark, Wood, Pith, Leaves, Flowers, Fruit, Seed* in *Plants*, may be form'd after the same manner ; and although there be not such various Preparations of the Sap in the one, as of the Food in the other, yet by the bare and simple Ascent, Descent, and consequently Circulation of the Sap, it can as easily form those dissimular Parts from the same Earth, and in the same Plant ; for the Reason of these various Preparations of the *Aliments* in *Animals*, is because the whole Substances are taken in at the Mouth, without any Distinction or Separation of one kind of Particles from the other, and that must be perform'd by the various Secretions, through the different Vessels, whereas nothing enters the Body of a Plant, but such and such Particles as are fit to enter, or can be receiv'd into the Vessels that pass directly to the different Substances.

Thus in *Trees* the *Bark* is *analogous* to the *Skin* in *Animals*, the *Wood* to the *Bones*, and the *Pith* to the *Marrow* ; for the Fibers of the *Muscular* Flesh, there is no need of that in *Trees*, for having no progressive Motion, they have no need of Muscles, *which are the chief and immediate Instruments of spontaneous*

neous Motion ; and for *Glands*, the Alteration of the Direction of the Motion of the Sap (*i. e.* when the Duct of one *Tubulus* is discontinued, and the Sap in its Ascent must from thence pass into the Origine of another) and the Situation and Disposition of one *Tubulus* in respect of another, do's the same Office in a *Plant*, as they do in an *Animal*. Therefore, when the *Root* of a *Tree* pushes out its *Fibers*, these *Fibers* are the Continuation and an Elongation of the same Substances of which the *Root* it self consists. If then this *Root* is woody, covered over with a *Bark*, the *Fiber* must be so too. If the Pores and *Tubuli* of the *Wood* and *Bark* be distinct in the *Root*, so they must be in the *Fiber* push'd from the *Root* also. As in the third Place, the *Fiber* is of the same Texture as to its Pores and constituent Particles throughout its whole Extent ; it must be likewise so in the *Etremity*, and if nothing can enter these Pores at the *Extremity*, but the Particles of such and such a Configuration, then the Substances compos'd by these Particles must be of the same Texture, Hardness and Consistence. Nor needs this be difficult to be comprehended, when we consider how it fares with the *Animal Body*, where though the *Blood* and *Humours* be more fluid, the Means us'd to force them into their several Recesses, by the various Motions of the *Animal*, are more powerful ; and though the Orifices of the *Glands* by the Softness of their

Texture, are more variable, as to their Configuration, yet we see what a Distinction there is betwixt their several Humours, separated in the different *Glands* of the Body. The *Glandulæ Parotides*, and *Maxillares* for the *Saliva*. The *Glands* of the *OEsophagus* and *Stomach* to assist the *Digestion*. The *Glands* in the *Pancreas* and *Liver* to separate the *Succus Pancreaticus* and *Bile*, to assist at the Separation of the *Chyle*. The Pores or Orifices of the *Lacteal Vessels* in the *Intestines* to separate the *Chyle*. The *Glands* of the *Kidneys* for the *Urine*. The *Orifices* of the *Spermatick Vessels* for Secretion of the *Seminal* Particles to be convey'd to the *Testes* and *Epididymides* in Men, and *Ovaria* in Women. The *Glands* in the *Brain* for the Secretion of the more spirituous Particles there. The *Glandulæ Lacrymales* for the *Lacrymæ* and that *Humour*, which bedews and moistens the *Eye*. The *Glands* in the Joints for the *Articulations* of the *Bones*; and lastly, the Orifices which separate the *Succus Osseus* in them, from the Blood-Vessels dispers'd throughout the *Bones*. Add to these the excretory Ducts, by which the superfluous Particles from the Blood are separated, to be perspir'd, by the *insensible Transpiration*. Now, I say, if we consider how all these various Substances are separated in the several Parts of the Body from one and the same Liquor, why may we not also suppose, that the Pores of different

different Structures may admit of the Particles which are only of such a Structure and Configuration, and fit for the composing of the different Substances in the same Tree from one and the same Earth.

Though all *Trees* are perennial as to their *Root, Trunk, and Branches*, yet they have that which is called their *annual and perennial Surface*. The *annual Surface* appears only in the *Spring and Summer-Season*, when they are cloath'd with *Leaves* and deck'd with *Flowers*; and in the *Autumn*, when they are loaded with *Fruit*, and have perfected the Seed. When the Flowers are spent, the Fruit is drop'd, and the Seed is ripen'd, the Leaves last of all fade, decay, and are driven away. But there are others, where, though the Flowers may appear in the *Spring*, or perhaps the *Autumn*, and the Fruit may ripen towards the *Autumn* or perhaps not till next Year, yet the Leaves never decay so as to leave the Tree altogether naked, but they gradually fall off as the new Leaves sprout forth. These are called *Ever-greens*.

The perennial Substance, or Surface of *Trees*, properly speaking, consists of these three Parts, the Bark, Wood, and Marrow. I shall not here make any Distinction betwixt those of the *Root* and the *Trunk*, only thus far as the Root has its proper Branches, by which the *Tree* receives the Sap usually called its *Fibres*. So the *Branches* of the *Trunk*

not only partake of this Sap for its Support, but also disperse it throughout the *annual Surface* of Leaves, &c. whether the *Tree* be ever-green or not.

To give a clearer Idea of the Bark, I shall give an Abstract of Dr. Grew's Description of it, so far as is fit for my Purpose. He says, *It consists of two Parts, the outmost, or Skin, and the main Body. The Skin is composed in part of very small Vesicles or Bladders cluster'd together. As the Plant grows the Skin dries, and the Bladders disappear. Among these Vesicles there are intermix'd parallel, ligneous Fibers or Vessels.* He makes a doubt whether these Fibers are Air-Vessels or Sap-Vessels; but I have no Difficulty to determine the latter. *The main Body has its Parenchyma, compos'd of innumerable small Bladders, cluster'd together. Its Vessels are diversify'd many ways. They are of two different Positions and distinct Kinds as appears.* 1. *As to their Positions, they stand most numerous in or near the inner Margine of the Bark.* 2. *From the most apparent Diversity of the Liquors or Saps they contain, which upon cutting the Branch transversely do frequently bleed from them*^a. I shall not trouble the Reader with enumerating his *Strata*, and their different Positions in the several Plants and Trees;

^a Grew's *Anatomy of Plants*, Book iii. chap. 2. p. 110.

nor shall I condescend upon the particular Use of the several Vessels mention'd by him, such as *Roriferous*, *Lymphatick*, *Resiniferous*, *Lactiferous*, &c. Its sufficient he divides the Bark into its *Vesicular* (which he calls its *Parenchyma*) and *Vascular* Substance, and that these Vessels are so situated, as to convey two distinct Kinds of Sap. From hence its easy to conclude, that which he calls the Skin, resembles the *Cuticula* in an humane *Fœtus* which when new born, is thicker in respect of the Skin or *Cutis*, than ever it is thereafter; for the Blood-Vessels in the *Cuticula* have been injected as well as the *Cutis* in a *Fœtus*, which is not easy to be done afterwards. As that part of the *Cutis* next to the *Cuticula*, is called the *Tunica Papillaris*, because endow'd with those *Papillæ* or small Vesicles which receive and retain the Particles separated from the Blood, until they be evaporated by the Transpiration, all which *Papillæ* terminate in the *Cuticula*; of which I had an excellent Opportunity to observe, at the Dissection of the Elephant at *Dundee*, *Anno 1706* (as in the *Philosoph. Transact*, No. 226, 227.) So in the Bark of Trees, that Vesicular Substance, both in that which we call the *Cutis*, and the *Parenchyma* of the Bark, may very well be suppos'd to be certain Receptacles of the superfluous Sap, which flowing out from the parallel *Tubuli*, are from thence convey'd out to be evacuated in the common Air. 3. This

Diversity of the Position of the Vessels, and the different Kinds of Liquors which he says bleed from them, plainly shews them to be the Arterial and Venal Ducts formerly mentioned ; and here again the Parallel holds, *for these Vessels, which he says are diversified many Ways*, resemble very well the *Tunica Reticularis* in the Skin of Animals ; for though there be no Necessity of such a Contexture in the common Teguments of Trees, as in the Membranes of Animal Bodies, such as the *obliquely ascendent, descendent, and transverse or circular Fibers*, by which they are capable of performing the several Motions requir'd, since there is no kind of Motion inherent in Plants ; yet such a Diversity of Fibers, by which they become *reticular or interwoven*, seems requisite in them too, especially in the Bark, whose loose Contexture might make the Fibers were they always Parallel, liable upon every slight Occasion to be distorted. Whereas by this *Contortio Fibrarum*, by their being so wreath'd and interwoven, the Parallel Fibers of the different *Strata* annually added, are kept firm in their Place, and there is sufficient Space between these various Intersections, for the Vesicular and horizontal *Tubuli* to convey the superfluous Sap outward : So that the difference betwixt the Bark and Wood, consists only in the looseness of the Texture, and intermediate, excretory Ducts and Vessels, by which

which the Sap transpires in the one, and the Compactness of the parallel Fibers in the other.

The *Bark* has its Vessels either proper for its own peculiar Nourishment, or common for the Nourishment of the annual Surface. This is analogous to what is to be observed in the *Animal Bodies*, for the *Heart, Lungs, Liver*, and all the other *Viscera Abdominis*, have much more Blood circulating through their several Substances, than is requisite for the Support of the vegetable Life, beside what is bestow'd upon the *Muscles* and *Brain*, for the better Performance of the Animal Motions and Secretions. And had this *Analogy* been hitherto duly consider'd, Persons of good Sense would not have been at such a loss how to do with the Sap in the Winter Season, when the *Animal Surface* has drop'd off; for 'tis easy to conceive how that same Sap which formerly push'd forth the Leaves, Flowers and Fruit, may now be employ'd either in encreasing of the Bark and Wood, or by frequent Circulations be better attenuated and prepar'd for putting forth a new annual Surface in the ensuing Season.

By what is said 'tis easy to have an Idea of the Structure of the Wood, and to suppose, that the manner of its Augmentation is by the annual Addition of several *Strata* of parallel, *cavous Tubuli*, for the ascent and descent of the Sap. That the lengthening or
B b 4 hightening

heightening of the Tree depends upon the *Vernal* and *Autumnal Shoots*, and that the Addition of the *Strata* of the *Tubuli*, by which it encreases as to its Grofsness, is perform'd during the Summer and Winter Solstices, so that there is Business enough to continue the Sap in a perpetual Motion throughout the whole Year, and no Occasion for its Stagnation or stopping at any Time.

For the better understanding of this, we may look upon the Fibers of the Root to be so many Pipes, like those of an Organ, obliquely or perpendicularly plac'd, and parallel to each other, whose Orifices are differently configurated for the Reception of such Particles as can be conveniently admitted into them, so that some enter those which compose the Bark, and others such as make up the Wood. That these Particles ascend, being press'd upwards by such as follow, and for the Augmentation and Encrease of different Substances. And for such as are superfluous, they either flow out by the Bark, are deposited into the Cavity where the Pith is lodg'd, or return by the venal *Tubuli* to the Root again, and so continue to circulate.

That the Pith is nothing but a *Depositum* of these superfluous or excrementitious Particles incapable to continue in *Area Circulationis* seems to be evident from Dr. Grew's Observations, *viz.* That as the Bark and Wood grow thicker every Year, the Pith grows more slender,

slender, and that it is only moist for the first Year, and dry always thereafter. And Mr. *Bradley*, who says “ ’tis made up of little “ transparent *Globules*, like Bubbles which “ compose the Froth of any Liquor: For we may suppose that the Pores of the Root of the young Tree or Shoot, proceeding from the extended *Oculus* or Bud, are at first very open, that the grosser Particles which compose the Pith, not being so subtile as those whereof the ligneous and cortical Fibers are compos’d, are thrown aside towards the Center; and make up a soft Substance, which by being loose and incoherent, easily yields, and gives way to the additional *Strata* of the *Ligneous Fibers*. But this Pith is very useful at the beginning, by keeping the young and tender Twigs so flexible that they bend and yield to every Blast of Wind. Whereas were they firm and hard (which they would be without this Pith) they would be ready to break; and in this they are analogous to Bones, which were it not for the Marrow, would be easily fractured by a very slight Accident.

The annual Surface of the Tree comes next to be considered. As the Seed contains the *Primum Principium* of the whole Plant, so the *Buds* contain the first Lineaments of the several Parts belonging to the *annual Surface*. They are three-fold: 1. The *Oculus*, *Gemma*, or *Bud* for the *Wood*. 2. For the *Flower*; and 3. For the *Leaf*. These for the *Wood* are

are usually at the Extremity, and sometimes at the Sides of the last Year's Shoot, especially at its lower part, when they with the Leaves are alternately plac'd; for when they are situated by Intervals, or in Pairs, then the *Oculi* for the Wood are always at the Extremity, where they as it were padlock the Shoot, so that it can be stretch'd to no greater Length. When the Shoot is strong in a good Soil, sometimes two or more of these *Wood-Buds* will be put forth, and sometimes the Bud for the Leaf will become a Bud for the Wood, as Mr. *Fairchild* observes. These for the Flower are mostly at the lower part of either the last, or the Shoot of the Year before that. For Gardiners observe, that generally speaking, they are two Years in forming. These for the Leaf do proceed *è Foliorum Alis*, at the Root of the Pedicle for the Leaf of the last Year. After the Winter Solstice is over, when the Sun begins to return towards our Horizon, the Particles of the Earth ascend more freely, the common *Tubuli* in the Bark begin to be dilated, and the several *Gemmæ* by degrees are expanded and spread forth.

As the *Stolones* or *Shoots* are added every Year, so they always remain, unless they be accidentally or designedly remov'd before the Tree is fell'd. Some Trees only put forth one Shoot in a Summer-Season, as the *Peach-Tree*, &c. but the generality of them put forth

forth two, the *Vernal* and the *Autumnal*; the *Vernal* is lengthened from the beginning of the Expansion of the Bud in *January*, to about the latter end of *May*, or beginning of *June*, when it ceases. This is call'd the setting Time, and is more late or early, according to the Soil or Season. Every Shoot partakes of three different Substances, the Bark, which is very thin, one *Stratum* of Ligneous Fibers; and the Pith, which in some such as the Elder or *Sambucus*, makes up the greatest part. When the Shoot is fully set, there are a few more *Strata* added to the Ligneous Fibers, the Bark is proportionally thickened, but the Capacity of the Pith is lessened; and now it is that the Fibers of the Root are also extended; for no sooner do the Shoots cease to lengthen, than the Fibers of the Root are stretch'd forth. Now it is also, that the several Buds for the ensuing Year begin to be form'd. In the Month of *July* Preparation is made for the second Spring. This stretching forth of the Fibers of the Root in the Summer, has hitherto been but little observed, though I am credibly inform'd by that accurate and expert Gardiner Mr. *Thomas Fairchild* at *Hoxton*, that a Tree may be as safely transplanted during the Summer as the Winter Solstice, provided due care be taken to keep the Root from being too much expos'd to the Air, and dry'd too soon. About the beginning of *July* the Buds for the autumnal

tumnal Shoot begin to be stretch'd forth,
 and the other Buds of the Vernal Shoot are
 fully form'd and strengthened. Now again
 the Root ceases to stretch forth its Fibers,
 the Autumnal Shoot is lengthen'd, the Fruit
 and Seed is ripen'd, and scarce any Provision
 is made for strengthening of the Bark and
 Wood before the latter end of *September*,
 when the Fruit is shaken off, and the Leaves
 begin to drop; and henceforward, until the
 Spring, the two Shoots of the preceding
 Season are strengthened, the Bark and Wood
 more plentifully nourish'd, and the Root sends
 forth a new Supply of Fibers. And why
 should this decay of the Annual Surface in
 Plants seem so strange to some, that they
 must needs attribute it to the return of the
 Sap to the Root, as if it were not to be ob-
 serv'd in Animals also, as one of the Conse-
 quences of their Vegetative Life. Most of
 the *squamous Fish* throw their *Scales* every
 Year; for in some Seasons they shall be
 catch'd very rough, and at other Times with
 very smooth *Scales*. The Reptiles, such as
Serpents, throw their Skin, called upon that
 account their *Exuviae*, most Birds throw
 their *Feathers*, and most Quadrupeds their
 Hair. The Hart and Roebuck throw their
 Horns; and who will be at Pains to observe
 it, the Hair in a Man or Woman's Head do's
 not continue above two Years, and scarce so
 long, especially if the Person is young; and

I hope none will say because of that, that the Circulation of the Blood is stop'd.

The *Leaves*, which as I said, arise alternately or in Pairs, are so obvious, that I need give no particular Description of them, but I may enquire into their Use. Their being Ornamental, or a Shade to the Fruit, is not all, though it is very agreeable to see a Tree cloath'd with Leaves; and when they are eat up by Caterpillars, or blasted and burnt up by Lightning, the Fruit either aborts; or if it chance to ripen, it is still dry and unfavoury: Yet they seem to be design'd for a more special Use, and to contribute more for the vegetable OEconomy of the Plant than has hitherto been imagin'd, which is for the better Attenuation of the Sap, as is observ'd *Page 350*, when by frequent Circulations it is not only render'd more fit for the Formation of the Fruit and Seed, but also to be adapted to the Substances of the Wood and Bark in the Winter-Season, when the *Tubuli* and Pores are more contracted, and where the grosser Particles cannot so conveniently enter. If we consider the special Care to separate the Spermatick Particles by the various Turnings and Windings in the *Testes*, and that prodigious Number of most minute Glands in the cortical Part of the Brain, for the Secretion of the most subtile Particles of the Blood there, this Use for the Leaves may be the more easily comprehended. This is farther illustrated

illustrated, *page* 248, &c. *Essay* 4. when treating of the Preparation of the Sap for the Male-*Farina* in the Flowers, and Female Seed in the Fruit of Plants; and *Page* 342, when speaking of the *Poppy*: To which I need add no more, but that though the Flowers are form'd in Buds of one or two Years old in most Trees and Shrubs; yet the Vine produces them from the Vernal, and sometimes from the Autumnal Shoots of the same Year, as it was to be observ'd this Season in *the Physick Garden* in *Chelsea*, and Mr. *Fairchild's* at *Hoxton*, when it produc'd ripe Grapes at *Michaelmas*. The Buds upon the former Years Shoots are fully form'd in the *July* preceding, where may be plainly descry'd the Clusters of the Buds of *Flowers* within one *common Blossom*. Its natural to suppose the Buds may be form'd, and bear upon Shoots of the same Year in them, because where they have Vineyards, they cut down the Vine yearly to the Ground; for the Sap circulating throughout the whole Plant in the Winter-Season, would weaken the Root too much. The Pores in the Extremity of the Fibers of its Root, are so wide, and the *Tubuli* proceeding from them so large, that by applying a Glass Tube to one of the Branches transversely cut in the Spring, so adapted that none of the Sap can flow down from the Stump and be spilt, it will visibly ascend or descend in the Day-time, according to the degree of Heat, as if it were a Weather-Glass. This reciprocal Motion

Motion of the Sap, sometimes more to the Root, at other Times more towards the top; now to the Annual, then to the Perennial Surface of the Tree, is rather a Confirmation than a Contradiction to the Opinion of its continual Circulation, which by what I have said may seem to be undeniably prov'd; but for the farther illustrating of it, I shall take under Consideration the several Kinds of Graftings.

1. That by the *Slip*, which is perform'd in the Months of *February*, *March*, or *April*, when the Shoot cements and incorporates with the Stock, the Sap first flows out at the incised Stump, and forms a *Callus* until it has forc'd its way into the *Tubuli* of the Shoot; after which it flows no more out at the Stump, but ascends and descends betwixt the Stock and Graft as formerly when the Stock was entire.

2. By *Inoculation* this is perform'd in the latter end of *June* or beginning of *July*, according to the *Setting Time*. I refer the manner of doing it to expert Gardiners, whose Business it is. The inoculating of a *strip'd Bud* into a plain Stock, and the Consequence that the Stripe or Variegation shall be seen in a few Years after, over all the Shrub above and below the Graft, is a full Demonstration of this Circulation of the Sap. This was first observ'd by Mr. *Wats* at *Kensington*, about 18 Years ago: Mr. *Fairchild* perform'd it 9 Years ago; Mr. *Bradly* says he observ'd it

it several Years since ; though Mr. *Lawrence* would insinuate as if he had first discover'd it*. That Experiment perform'd in a *Jessamine*, is now to be seen in Mr. *Fairchild's* Garden. In *July* 1717, having a plain *Jessamine*, which mounted pretty high upon the Wall, being an old Shrub with two large Trunks arising from the Root, at one Foot Distance, where both were covered with Earth. He inoculated a strip'd Bud in one of the Stocks, which was four Foot high. Last Year it put forth several Shoots very elegantly strip'd ; and this Season several Stripes and Variations appear upon the other Trunk, which is above six Foot high. This not only proves an Ascent and Descent of the Sap in the same Trunk, but also that it circulates throughout the whole Plant to a great distance ; for modestly speaking, there appear'd this Year Stripes upon Leaves no less than twelve Foot distant from the Place where it was engrafted.

The consequence of these Graftings makes good my Assertion, p. 340. *That the difference of the several Compositions depends upon the several Configurations of the Pores, which only admit of Particles of such and such a Figure, and deny Entrance to any other ; or if they do enter, they must be molded and fashioned according to the frame of the Pore.* For here we see, that after a

* *Clergyman's Recreation*, p. 65.

Bud or Slip is inoculated or grafted in the Stock of another Tree, whatever passes the *Callus* (this cemented part) betwixt the Stock and Graft, partakes of the Nature of the Graft, and not of the Stock. Nay farther, that the Stock below shall, in process of Time, be of the same Texture with the Graft above, but the Graft above never alters from what it was, before it was taken from the Mother-Tree; or if it do's 'tis to the better. This can proceed from nothing, but when the Particles ascend from the Stock, that they cannot enter the *Tubuli* in the *Graft*, until they be fitted for its Orifice, *v. g.* Suppose a quadrangular Particle to ascend opposite to a triangular Pore, being forc'd upwards, it must be depriv'd of some one of its Angles, that it may enter into the Pore which has only three Sides: and again, suppose a triangular Particle to ascend directly towards a round Pore, all its Angles must be rub'd off before it can have Admittance: So that the Particles which proceed from the Substance of one Combination entering that of another, must be so framed as to coalesce, and be united with that Substance into which it is entred, and rendred incapable of joining any more with the Substance from whence it came, and the new molded Particles augmenting in their Number as they return to the Stock in Process of Time are capable to render the Substance of the Stock, homogenious with the Graft, but the

Graft never becomes homogenous with the Stock. Hence it is that the Fruit always partakes of the Nature of the Graft; that one Tree shall produce several Fruits of different Kinds, according to the several Grafts; that the Fruit from a Shoot grafted in another Stock, shall be more delicious and fine than that of the *Mother-Tree* from whence it was taken, because the Particles have not now so easy an Admittance into its Pores as formerly, when nothing intercepted them in their Ascent from the Root; but they must be farther attenuated before they can enter the proper Pore, which is not now so parallel to the *Tubulus* below as formerly; and 'tis by the Descent of the Particles from the Graft, and their Re-ascent, that the Variegations appear in the other parts of the Shrub: A pregnant Example of which happen'd to Mr. *Bridgman*, Gardiner at *Hertford*, who engrafting a *Hedgehog Slip* into a *Holly*, the *Graft* dy'd, but another Variegation appear'd afterwards below it, upon the same Stock.

Circumcision (as the *Gardeners* call it) is a third Argument of the Circulation of the Sap. Mr. *Fairchild* has in his Garden a *Wall-Pear-Tree* divided into three principal Branches. Three Years ago he cut off the Bark, round each of them (in the Month of *May* or shortly before the Setting-Time) in two Places, at about three Inches distant, and made the Wood very bare betwixt the Incisions. In

the *September* following the Bark swell'd very much above the Incision. The Spring following they produc'd Fruit very plentifully, and so they have done every Year since: So long as the Bark remain'd disunited, they never put forth any *Wood-Shoots*, but produc'd *Flower* and *Leaf-Buds* very plentifully; so that the Sap which was formerly bestow'd upon the Shoots, is now spent upon the *Bearers*, as they are called, *i. e.* upon the *Flower-Buds*. Not long after, the cortical Fibers were extended, and the Bark join'd from above and below in that part of the two lateral Branches which is toward the Wall, since which they do not produce Fruit so plentifully; but they begin again to make for the encrease of the Tree, by putting forth *Wood-Shoots*. But the Bark in the *middle Branch* still remaining disunited, continues to fructify plentifully, sends forth no *Wood-Shoots*; and as it begins to blossom more early in the Spring, so having drop'd its Leaves a Week before *Michaelmas*, the Leaves of the other two remain till past the middle of *October*. From the beginning of *September*, after setting of the *Autumnal Shoot*, the additional *Strata* of the Bark plainly appear by a new Tumefaction or Swelling at the upper part of the Incision. Below the Incision the Branch is only four Inches round. About the bare Wood, where 'tis depriv'd of the Bark, it is three Inches, and above the Incision it is six Inches. This Augmentation

in the Bigness of the Branch, clearly demonstrates how the Sap, being interrupted in its Descent, immediately returnstoward the top; that the Circulation is as well maintain'd from the incis'd part as from the Root, and that the annual Surface may, upon extraordinary Occasions be as well nourish'd by the *ligneous* as *cortical Fibers*; for if (in this case) the Sap did not ascend by the Wood, it would not return so plentifully by the Bark, especially after so much is spent upon the Fruit and Leaves, beside what flows out by the insensible Transpiration.

This Experiment alone is able to clear up the Debate, Whether the annual Surface is nourish'd by the Bark or the Wood; and along with the Observation of the *stript Jessamine*, to shew that the Bark and Wood have not two distinct, but one common Circulation: For if the tinctur'd Sap descended four Foot, pass'd through the Root under Ground to another Stock which mounted six Foot, and has been seen upon the Leaves in several Branches of that Stock, perhaps at two or three Foot Distance; (to all which I have been an Eye-Witness) and if the same has been observ'd by others upon twenty different Plants of *Jessamine*, as Mr. *Bradly* affirms, that puts it past all doubt, that the Sap has as common and free a Circulation throughout the whole Body of Plants, as the Blood circulates in Animals. If 2. By bereaving the Trunk or Branch of a Tree of
its

its Bark, it shall fructify more plentifully, not only the first Year, when it may be suppos'd the Sap already mounted above the incis'd part may do it ; but for ever after, so long as this *Solutio Continui* remains of the Bark ; and if its observ'd, that no sooner do the cortical Fibers unite, than this plentiful Fructification ceases, and the Tree makes more to the Wood than to the Fruit as formerly, which it continues to do until another Incision is made after the same manner. This to me seems very evident, that though the Bark and Wood are two different Substances, yet there must be such a Communication betwixt their *Tubuli* at the Extremities, as there is betwixt the Arteries and Veins in Animal Bodies, by which the Circulation is freely maintain'd. Therefore Mr. *Parent* his Examples of the *Elm-Tree*, which was depriv'd of its Bark from the Root to the Branches, and yet produc'd Leaves ; of other four *Elms* in the *Garden of Luxemburgh*, that were stript quite naked from a little above the Ground, to pretty high in the Trunk (and one of the four which had no Bark left at all) yet liv'd four or five Years, and produc'd Flowers and Leaves ; and of the *Platanus* or *Maple-Tree*, that being depriv'd of its Bark, it was soon cloath'd with more, as the Serpent is with a new Skin, may well be credited. But I am not of his mind, that the *Pith* affords any Nourishment to the

“ Plant, as he would pretend in the *Elder*
 “ and *Vine* while they are young, and after-
 “ ward by the *Ligneous Fibers* while they
 “ are old. Neither is it a Proof that the
 “ whole Nourishment is deriv’d from the *Lig-*
 “ *neous Fibers*, because of the sudden en-
 “ crease of the Slip after Grafting *. But in
 my humble Opinion the Bark and the Wood
 are nourish’d by proper *Tubuli* belonging to
 each; the annual Surface is more peculiar-
 ly nourish’d by the *Tubuli* common both
 to the Bark and it; the *Pith* has no pro-
 per Vessels for its Nourishment, but is on-
 ly a *Depositum* of some certain Particles
 at the beginning, or during the Formation of
 the *Ligneous Fibers*, as has been observ’d, but
 upon any extraordinary Emergency there
 is such a Communication betwixt them, that
 the one very readily supplies the Defect of the
 other, which may be farther confirm’d by the
 following Example.

Mr. *Fairchild* informs me, That if this In-
 cision is made upon the Trunk a little above
 the Ground, before it has emitted any lateral
 Branches then it is ready to kill the Tree;
 but if it has sent forth but one small *Twig* of
 the Bigness of one’s *Finger* or *Thumb*, that
 will save the Tree alive. The Reason is plain;
 for the *Root* being depriv’d of the return of

^a *Histoire del Academie Royal des Sciences, pour L’an. 1711.*
 p. 55. Edit. Amst. 8vo.

the Sap by the Bark, all of a sudden it perishes, because what descends by the *Ligneous Fibers* is not able to support it; but when it receives a little by this small *Twig*, and when the Sap, now diverted, flows more plentifully into it, this, by a more speedy return is capable to maintain the Circulation betwixt the Root and it for some time, until the Sap flowing more plentifully and perpendicularly by the *Ligneous Fibers*, supplies the Defect of the Bark, and nourishes the *Annual Surface*, by opening a more free Communication at the top, betwixt the cortical and ligneous *Tubuli*, so that the Particles formerly employ'd in forming the *Wood-Shoots*, are now spent upon the *Leaves, Flower* and *Fruit*. Hence it is that the *Leaves* and *Flowers* blossom more early, the *Fruit* is more plentifully produc'd, because nothing remains for lengthening and encreasing of the Wood. *vid. p. 413.*

This Method of explaining the Nourishment, is, I hope, so convincing, that hereafter there shall remain no more doubt of the *Circulation* of the Sap. What now remains, is to enquire what is the *Materies* of this Nourishment, or whence it proceeds. The *Materies* is a *Congeries* of heterogenious Particles, so regulated and dispos'd, as to be capable to enter the Pores of different Plants, according to their several Configurations. I have hitherto spoken of the Earth, as the Element endow'd with the greatest quantity of these Par-

ticles; but if any of them are in the Water and Air, that do's not hinder their being admitted, so as to make up the *Compositum* of the Plant, provided they enter *Via Ordinaria*, as it may be call'd, by the Extremity of the *Radical Fibers*, as by the Mouth in *Animals*; for as no *Animal* can be nourish'd by what it receives into the Pores, no more can any Plant be nourish'd but by what it receives by the Extremity of its Fibers, whether it be by Slip or Root; nor can any Plant be nourish'd by *Air* or *Water*, otherwise than by such Particles suspended in these two, as are usually contain'd in the Earth.

Dr. *Woodward* is in the right when he asserts, that the Water do's not nourish a Plant; but when he affirms, *That a great part of the Terrestrial Matter that is mix'd with the Water, ascends up into the Plant as well as the Water*^a, I cannot join with him. By *Terrestrial Matter* must be meant a *Congeries* of the various Particles of which that gross Substance call'd Earth, is usually compos'd: That I am positive can never ascend up into the Plant as well as the Water. But if we are to conceive some active Particles in this Terrestrial Matter capable to be diluted, and being suspended by the Water, fit to enter the Pore of the Plant, and to be convey'd into its most intimate Recesses, by the Water,

^a *Philosoph. Transact. No. 253. page 209.*

which is a *Menstruum* to it ; that may be easily yielded to. And for the Water it self, though it may be insinuated into the *Tubuli*, distend and stretch forth the Vessels, extend the length of the Plant, by interposing betwixt the Interstices of the nutritive Particles, and conciliating a greater Space for them to move in, thereby encrease the Weight, and augment the Bulk of the Plant ; yet it can no more be said to nourish it, than a Man can be said to be fed by drinking a prodigious quantity of Water, so as to distend his Stomach. *The Doctor* (supposing the common *Nitre* sold in the Shops to be the same with the *Nitro-aerious* Particles, an Expression which some have us'd for explaining the Vegetation, and the *Lixivial Salt* in the Ashes of Wood, to be the same with the *Salino-sulphureous*) dissolv'd, a Dram of Nitre in Hyde-Park Conduit Water, and put Mint among it in a Glass. In another Glass he dissolv'd an Ounce of good Garden Mold, and a Dram of Nitre ; in a third half an Ounce of Ashes of Wood, and a Dram of Nitre, by all which he obtain'd what was to be expected, viz. the sudden Death of the Plant^a.

What has been said of the Water, as being an *Element* by which Plants are nourished, may also be said of the *Air*, viz. That however it may suspend a great Quantity of dis-united and dis-join'd, heterogenious Particles, which by their Grossness and Incapacity of

^a Ibid. 206,

being long suspended, may fall down upon the Earth again, near any Plant, and by the Fluidity in the Earth it self, or by the subsequent Rain, may be so far introduc'd into the Substance of this Earth, as being apposite to, may be receiv'd by the Radical Fiber of the Plant. But I have no imaginable Idea how a Plant can be nourish'd by the Introduction of the aerial Particles through the Pores of its Surface above Ground. Therefore I am ready to assign another Use to those Vessels call'd *Tracheæ* by the Celebrated *Malpighi*, and the *Air-Vessels* so frequently mention'd by the Learned Dr. *Grew*. Their too great Fondness of these *Tracheæ* or *Air Vessels*, having not only perverted their own penetrating Judgments, but also led others too obsequiously into their Opinions, without being at Pains to examine the Matter themselves.

But if any shall duely consider, That all Plants are nourish'd by the ascent of Particles from the Earth, supposing they did not descend in a Circulation, but that the superfluous Particles flow'd out as it has hitherto been believ'd, at the top, how can it be suppos'd that the aerial Particles can enter by these Pores, by which the other were transmitted? This would infer a quite contrary Course in one and the same Duct, which is contrary to all the Rules of Mechanism; for at this rate, either as *Theodorus Craanen* imagin'd, there must be two Kinds of Pores, *viz. Foris-intro*, and *Intro-foris*

foris Spectantes, or all the Pores in the Plant being directed the same Way, the *Transitus* of the Particles through them must have the same Course; and this must rather be an Efflux than an Influx. The great *Dispendium* in *Nicotiana*, formerly mention'd, *viz.* That of six Pound and a quarter, it lost two Pound and a half in three Days Time, is a full Proof of this; and as a further Evidence, another Plant of *Tobacco* of the same Soil, of four Pound and a quarter, has now remain'd a Week with Roots plac'd among Water; and it has rather encreased than diminish'd in its Weight, brisk and lively, enlarging Blossoms, *spreading Flowers*, and filling the *Seed*. I have already accounted how Water may be said to augment a Plant, but not to nourish it; and the Reason why this second *Tobacco Plant* still continues to be the same, is very plain; because a new Succession of Particles from the Water ascend, and succeed to those which daily continue to avolute through the Pores of the Plant; nor need I have recourse to any other Experiment than what usually happens, *viz.* when a Plant is pull'd up by the Root, according to its Texture; first the Flowers, then the Leaves begin to corrugate and become wrinkly and crumbled, or wrap'd up, and afterward the whole Plant, *viz.* the Stalk and Bark, and last of all the Wood, decay and dry up. And whence can all this proceed, but from a *Dispendium* of Particles through

through the Pores, and that Liquor formerly in the Vessels, now evaporated in the common Air? From which I have the greatest Reason to conclude, that all the Pores in the Plants are for the Emission or Egress, and not for the Immission or Ingress of Particles into the Plant. Nor is it any more difficult to explain by this System, how the Air should become as beneficial to Plants as to Animals. 'Tis true, that Animals have real *Tracheæ*, the Wind-Pipe, or *Larynx* and *Lungs* into which the Air is admitted, and that without Inspiration as well as Expiration, they cannot live; but it is now demonstratively prov'd, that our Breathing is not in order to the Admission of aerial Particles into the Blood it self, but to render the Blood (formerly disunited by the frequent Circulations in the Vessels through which it had pass'd) more firm, compact, and its Particles by the Pressure of the Sides of the Vessels more strictly united and combin'd into *Globules*. But whereas in Animal Bodies, if by being too suddenly, or too much expos'd to the Air, the external Pores shall be shut and contracted so, that the daily Transpiration is hindered, if not quite stop'd, we feel a great Uneasiness over all our Body, and we are expos'd to various Distempers, such as *Colds*, *Catarrhs*, *Coughs*, *Rheumatisms*, *Diarrhæa's*, *Fevers*, *Agues*, &c. In a word, as there is scarce any Distemper incident to us in these cold Climates, but what may be more
or

or less suspected to proceed from the Obstruction of our Pores ; so in Plants, the exposing them more or less to the Air, the affording a more or less Degree of Heat to shut or open their Pores, may make them either live or die ; make them brisk, lively, and to *sprout, bud,* put forth their *Blossoms* and *Leaves*, or *droop,* look faded, and throw their Leaves ; for if the Particles have got into the excretory Ducts in the Bark, hesitating there, it hinders the Excretion of any more from the *Tubuli* ; these, by a continual Succession of Particles from the Root, become too much distended, and the vegetative OEconomy is disturb'd throughout the whole Plant. How much will a cold and frosty Blast of Wind kill the tender Buds in the Spring, and bereave the Gardiner of a plentiful Expectation of Fruit ? so that he who hug'd himself the one Day by the glorious Appearance of *Blossoms*, one Night or two shall deprive him of all his Hopes, all these Blossoms being dry'd up, mortify'd, and depriv'd of the common Life with the Tree ; and on the other Hand, an imprudent Management in the Stove, will, by too great a Heat, force up the Sap so precipitantly, and dilate the Pores so, that the least supervenient Cold upon shutting of them, is ready to put the Plant in danger of its Life, if not kill it altogether.

This naturally leads me to the Consideration of the *Succulent Plants*, of which so
great

great a Variety has been transported to *Europe* within these Forty Years. See *Essay* 3. p. 204, 205. They are suppos'd to live by the Air, but they may rather be said to live by Water. I confess, I have not hitherto so far examin'd their Structure, as to give so general an Idea of it as will suit with all their *Phænomena*: But upon the viewing a small *Aloe* in *Mr. Fairchild's Garden*, which has a short thick Leaf, cut off as it were in the middle, being thick, broad, and as it were quadrangular at the Extremity; I say, upon beholding its Structure 'tis no wise difficult to explain several of the *Phænomena* incident to its *Congeners*. Its external Coat consists of parallel Fibers strictly combin'd and closely united together, so that its Pores must be very minute and small, with several pretty large longitudinal *Tubuli*, of different Magnitudes, but visibly cavous, running up its back part, and turning obliquely downwards, when they come to the obliquely flat Extremity. Its inner Substance is *Diaphanous* or *Transparent*, so that either the Sun-Beams, or the Candle-Light will shine through it for the Space of two Inches. This is a *Congeries* of most thin, fine, delicate, membranous *Tunicles*, intersecting each other, like the Caverns of an Honey-Comb. These *Cellulae* are full of Sap, scarcely communicating with one another, but by small minute Pores; for if you cut one Series transversly, it will be only empty'd,

ty'd, and no more will flow out. From this ocular Inspection 'tis easy to explain all the Incidents of this Plant. 1. It can be nourished by a very small Quantity of Earth, because it has no other *Parenchyma*, than its outer Membrane, and the Addition of a very few Particles will support it a long Time. 2. Not being porous, nor being endow'd with so many Divarications into small *Tubuli*, its Sap can neither be farther attenuated, nor will the minuteness of the Pores permit it to be evaporated; so that the *Celluls* can remain along time repleated with that ferous and diaphanous Liquor, without being exhausted; and after the Capacity of its Leaves is full, it may live as well suspended in the Air as in the Earth. 3. It must be kept warm in a Stove all the Winter, to prevent its Sap from being congeal'd or frozen; for if this viscid Liquor were once depriv'd of the intestine Motion of its Particles, they could never sustain the Life any more. 4. When it's to be transplanted, or any new Shoot from it improv'd, it must be suspended or lie a good time above Ground, until much of its Sap is evaporated; otherwise, when put into rich, new Ground, by the addition of too many nutritive Particles at once, 'twould be ready to be surfeited and choak'd.

Though the other *Succulent Plants* are not all of the same Substance, but some are more fibrous, others more cellulous, the Juice of
some

some milky, others viscid, and a third transparent and ferous; yet they all agree in this, that their Juice is not so volatile as to evaporate speedily; their Pores are extreamly small, and external Fibers compact; that when their *Parenchyma* is once well form'd, and competently nourish'd, a very small quantity of Earth will serve to do more, but rather a small addition of Water is wanting to dilute the viscid Juice, when perhaps the more tenuious Parts are evaporated, and the vast addition some of them receive in their Encrease and Weight, while in a small quantity of Earth, must depend upon the necessary Supply of Water, which keep both their vesicular and vascular Substance repleated and distended; but if there be too great a quantity of Water furnished to them, they will be ready to rot and gangrene, from too great a Distention of their Fibers. Hence it is that some of the prickly Kind will distill clear Water at the Prickles, which cannot evaporate at the Pores; and without this Bleeding, as 'tis call'd, the Plant would be ready to perish. This general Idea of them may serve until a more strict and exact Scrutiny be made into their Structures; but by all this it plainly appears they are never fed by the Air. Dr. *Udal* at *Enfield*, has a great Variety of them in great Perfection, as has Mr. *Fairchild* already mention'd, who has been so kind as to favour me with the Delineation of a few of them in Copper-Plate, among

among whom is the little *Cushion Aloes* now describ'd. Nor is Dr. *Sherard* wanting to enrich this *Island of Britain* with a continual Supply of new Species from his Correspondents Abroad.

I conclude with the Examination of the Principles upon which Mr. *Bradly* has founded the *Generation and Vegetation* of Plants, such as *Suction, Attraction, Steam and Vapour, Condensation and Stagnation.*

1. *Suction and Attraction: The Root having suck'd in the Salts of the Earth, p. 4.— Or by its magnetick Virtue, p. 14. By its attractive Quality, p. 19.* All these are reciprocal Terms, which differently express the same Thing, for *Sucking* is only a *Drawing*. Where-ever they obtain the *Vis Impellens* and the *Vis Attrahens*; the *impellent* or *sucking*, and *attractive drawing Power*, must be of greater force than the *impell'd, drawn or attracted Subject*. 2. There must be a *Causa Efficiens* for the *Motus* of the *Res à quo* to the *Res ad quem*. In Pumping, the *Leather* and the *Manubrium, Handle and Chain*, to which the *Pump-Box and Leather* is fix'd, are set in Motion by a Persons Hands, or some other *Engine*. In *Sucking and Drinking* the Motion of the *Muscles* for *Inspiration*, and of the *Cheeks*, are the *Impellents* of the *Liquor*. In *Attraction*, the Power of the *Magnes* must be greater than that of the *Steel* which it attracts.

I do not here pretend to explain how this *Attraction* and *Suction* is perform'd, that being extrinsick to my Design; but from hence I infer, 1. Though the Root be of greater Force than the Particles said to be suck'd into it, yet it can never have the *Vis Impellens*, because it wants the *Causa Efficiens*, therefore the nutritive Particles can only enter the Extremities of the Root in their accidental Ascent; and if they were not thus intercepted by the Pore ready to receive them, they would evaporate into the common Air. Nor, 2. Can it be *imbibing* as a *Sponge*, for the Roots of Plants are so far from being *spungy*, as Dr. *Grew* imagines, that they are as solid, or rather more solid, and cloath'd generally with a thicker Bark, than any part of the Plant. 3. The subtile Particles from the *Farina* can never draw the gross, nutritive Particles to the *Seed* in the *Seed-Vessel*, with greater Force than the Motion already conciliated to them by the subterraneous Heat; but the effect of these Particles from the *Farina*, must be produc'd by Penetration. See *Essay* 4. p. 277. a pregnant Example of this Penetration is as follows: Take a Solution of *Vitriol*, and write with it upon *Paper*, the Writing will immediately disappear and become invisible; write above it upon the same Paper with Ink made of *burnt Cork*, which will be visible; placethis Writing next the Cover in one side of a Book, and

and place exactly opposite to it, in the other side of the Book (suppose it to be a pretty thick *Quarto*) some Cotton dip'd in a Solution of *Calx Viva*, or *quick Lime*, and *Auripigmentum*; shut the Book close, and put it into a Press, and in a few Minutes the visible Ink shall disappear, and the invisible Ink will appear. This I have seen often done. Now if such a Penetration can be perform'd through a pretty thick Book, why may we not suppose subtile Particles may flow from the *Farina* in one part of the Flower, or from a Neighbouring Flower in the same Plant or *Species*, and penetrate the *Seed-Vessels* and *Seed*, especially since they have the same Configuration of Particles and Pores.

Steam, Vapour and Condensation. Made to evaporate in a *Steam*, as the Matter in a *Still*—When the *Vapour* arrives at the extream Parts of the Buds of a Tree, it meets with Cold to condense it into a *Liquor*, p. 4. Where there is a *Steam* or *Vapour*, there must be a large, capacious Cavity, in which the disunited and rarify'd Particles, may move freely; for if they are confin'd within a small Space or Bounds they must be strictly united, which is called *Condensation*, and then they appear *sub forma Liquoris*. And what a vast large Root must the *Vine* or *Birch-Tree* have, if this be the Case to contain the *Steam* and *Vapour* of such abundance of *Liquor* as flows upward from it in the Spring, or the Root of

a *Pompink*, which nourishes such large Fruit from so small a *Seed* in one Season. It were more reasonable to suppose, that the Blood in Animals were at first only a *Steam* and *Vapour*, because of the intrinsic Heat capable to rarify its Particles, occasion'd by the several ordinary and extraordinary Animal Motions; but we see the contrary, and that the Blood *sub forma Sanguinis* is contain'd in the *Tubuli* of the *Capillaries*, and at the Extremity of the Body, very near as minute as those of Plants: For it's from the Blood contain'd in the *Muscular Fibers*, that they are tintured with the red Colour, otherwise they would be as white as the *tendinous Fibers*, of which they are only the Elongations more loosely combin'd; and in how small Cavities the Blood is contain'd, may be suppos'd, when

1. By the Puncture of a Pin in the Skin, or any muscular part of the Body, the Blood shall flow out.
2. By the quantity of Blood in a humane Body, it being by a modest Computation about twenty five Pound, and yet the largest Vessel shall not be much above $\frac{1}{3}$ of an Inch Diameter; so that there must be a prodigious Number of Branchings and Divarications to contain the whole.
3. From the Injections of several accurate and expert Anatomists of this last and present Age into the most minute *Capillaries*, such as the late famous Dr. Nuyk and Rysch perform'd, and of which Mr. St. Andre,

Andre in *Northumberland Street* lately shew'd some curious Preparations to the *Royal-Society*.

I say, if all these shew that the Blood is never *sub forma Vaporis* in the Animal Bodies, where the natural Heat would be more ready to turn it into Streams, we can never suppose such *Steam* or *Vapours* to be in the Bodies of Plants, which are only endow'd with, as it were, a borrowed Heat, to set its nutritive Particles in Motion; but its more reasonable to think, that after one Particle has entred into the Pore of a Root, another may follow in that same Passage in a direct Line, and still more succeeding, the one presses up the other; that several of these minute *Tubuli* may be conjoin'd so as to form larger Trunks, and although the *Succiferous* Vessels are not to be seen so large in Plants as the Blood Vessels in Animals, because the quick Motion of the one is not so requisite as the other (for the heterogeneous Particles of the Blood must circulate more frequently, to be farther attenuated and prepar'd; whereas the nutritive Particles in Plants are prepar'd by their very entring into the Pore, otherwise they could not be receiv'd) yet there is the same Reason for the nutritive Particles of Plants to be condensed into a *Liquor* at first, as the Blood in Animals. And I cannot understand, 2. How the Buds of Plants can be form'd by the Vapours being condens'd and thicken'd into a Water when

they feel the Cold, p. 5. At that rate the *Buds* would be best form'd at *Christmas*, soonest come to blossom, and be most readily blown in the *coldest Spring*, which is quite the reverse from what really happens; for it's in the Heat of the *Month of July* that they are form'd, and it's by the *warmest Spring* that they are cherish'd and the most early *blown* and brought to Perfection.

Stagnation. The Sap is thicken'd or condens'd by the Winter's Cold, and is thereby chang'd into the Consistency of Gum; and being thus stagnated, cannot move any more until the following Spring, p. 7. That the *Warmth*, or some artificial Heat rarifies it into its former liquid State. No *Liquor* in *Area Circulationis*, can stagnate without the Succession and Accumulation of the subsequent, circulating Particles, which must be the cause of a preternatural Dilatation of the Vessels, from whence a *Tumour*, (as in the obstructed *Glands* in the *Animal Bodies*) such as *Scrophulous Tumours*, *Steatoma's*, *Sarcoma's*, &c. must be generated. And 2. No circulating *Liquor* can thicken, unless it is by the *Evaporation* of the more subtile, and the *Precipitation* and subsiding of the more gross Particles, the *Serum* which remains not being able to suspend them any more; and if the more intimate Union of this circulating *Liquor* is thus dissolv'd, no means whatever can make it to circulate aright again; and if that cannot be obtain'd,

obtain'd, it must become vapid, turn acid and acrimonious, as the Blood in the obstructed part of a Body becomes *ichorous*, and is so corrupted as to become *laudable Pus*, which at last becomes *serous*, *acrimonious*, and almost *corrosive*. But 3. This balsamick thickening of the Liquor was never yet observ'd; for all Plants that live in the Winter are observ'd to be as juicy at *Christmas* as *Midsummer*, and this Juice is as thin in the one Season as the other, which necessarily implies its circulating throughout the whole Year.

He says, (*Philosoph. Transact. N^o. 349. p. 487.*) *The Seasons of Motion in Plants, are the same with those Animals which sleep during the Winter.* This is for want of distinguishing betwixt the Animal and Vegetative Life; for *Swallows* and *Cuckoo's*, &c. have their Blood circulating in the proper Vessels, though its Motion is perhaps not so quick in the Winter, as much as it do's in other Animals while asleep, when the Animal Functions do not exert themselves.

I shall only add in this Place, that the Parenchymatous Fruit has a peculiar Circulation, as I have observ'd before in the Parenchymatous Roots; for heretofore they were wont to import *Melons* from *Portugal* and *Spain*, by leaving a good deal of the Stalk adherent to them, the better to entertain this *Circulation*, which is called the feeding of them. *Oranges* and *Lemons* are pull'd green from the Tree,

otherwise they rot in the Importation; and most of our Winter-Fruit ripens, after being shaken off the Tree. So long as the Circulation continues, the Particles are farther attenuated, and they live; but when that ceases they rot as much as the Flesh of an Animal corrupts and stinks when the Animal is dead.

Thus I hope I have prov'd the Circulation of the Sap in Plants, to be the same with that of the Blood in Animals, in so natural, plain, and intelligible a manner, that after its being so fully discovered, the Vegetation of Plants needs be no longer a Mystery. I could have added a great deal more, and explain'd a great many other *Phænomena*, but I doubt not what I have said may be a means to engage others to make farther Improvements upon these Hints.



APPENDIX.



APPENDIX

To be added to p. 271. l. 22.



DILLENIVS confirms my Assertion, that the *Apices* are never wanting in all *Flowers*, by the Example of the

“ DYCOTOPHYLLUM, where he observes,
 “ that this being a Water-Plant, has naked
 “ and solitary Seeds, *i. e.* one Seed to each
 “ Flower : That both Flowers and Seeds are
 “ furrounded by certain *Laciniae*, and that
 “ the Flowers have neither *Petala* nor *Sta-*
 “ *mina*, but only *Apices*; and though con-
 “ trary to most of the other Water-Plants
 “ (for the Flowers in them often mount above
 “ the Water when they begin to spring forth)
 “ these *Apices* are usually dip’d in the Wa-
 “ ter ; if they are squeez’d or press’d, as in
 “ the Heads of the *Musci*, they shed a soft
 “ and pulpous Matter (like that which is
 “ found in the unripe *Apices*) which being
 “ dry’d, appears globulous by a Microscope.
 “ He has not yet observ’d whether these *A-*
 “ *pices*

“ *pices* burst in the Water, for all he has seen
 “ were whole, though some of the Seeds were
 “ almost ripe ; which shews, that though they
 “ were not open, yet there is no doubt the *se-*
 “ *minal Effluvia* might flow from them, and
 “ impregnate the Seed, because the *Apices*
 “ are very near to them. Nor, perhaps, is
 “ it necessary that the *Apices* should burst,
 “ and be like such of the airy *Apices* (*aë-*
 “ *reorum Apicum instar*) as are upon Land-
 “ Plants, which shed the Dust to cover
 “ the Seed, when 'tis as reasonable to sup-
 “ pose, that in the form of a Juice the
 “ Matter might flow from the *Apices* in-
 “ to the Water, and be so convey'd as to
 “ impregnate the Seed. And this seems to
 “ him no small Argument that the *Apices* in
 “ the *Hippuris* are after the same manner,
 “ and that they are only flowering *Globuli*
 “ or *Folliculi*. This Plant is call'd *Equiset-*
 “ *tum palustre Ramosum* & *aquis immer-*
 “ *sum*. *Millefolium aquaticum cornutum*,
 “ C. B. *Raii Hist.* p. 191. Though in his
 “ Supplement, p. 122. he makes the *Mille-*
 “ *folium aquat. cornutum*, C. B. to be dif-
 “ ferent from the *Millefolium aquat. cornu-*
 “ *tum*, J. B.^a. This Observation answers to
 what is said, p. 299. and likewise shews *Dil-*
lenius to be of the Opinion, that it's the
Effluvia which impregnates, and not the

^a Dillen. *Nova Plantarum Genera*, p. 91. Tab. iii.

Farina in Substantia, which becomes the Seed.

To be added to the same Page, Line ult.

Boccone gives the following Account of the *Palma Dactylifera*, which he calls *Pistacium Mas Siculum Folio Nigricante*. “ This
 “ Tree is Male and Female. The *Mas* has
 “ its Leaves oval, oblong, thick and dark-
 “ green arising regularly by three and three,
 “ upon a Pedicle, whereof there is one Pair
 “ and an odd one at the Extremity. The
 “ Flowers are thick set *racematim dispositi è*
 “ *foliorum alis*. The Female Tree has its
 “ Leaves of a lighter green, larger, harder,
 “ and consisting of five Leaves upon a Pedi-
 “ cle. The *Embryones* are *Spicatum Dis-*
 “ *positi*.

“ When they are at a great Distance from
 “ each other, they fecundate the Fruit, and
 “ make it swell or conceive after the follow-
 “ ing Manner. They wait until the *Embry-*
 “ *ones* of the *Fœmina* begin to appear; they
 “ take a Branch of the *Pistacium Mas*, and
 “ place it in a Vessel surrounded with Earth,
 “ and moisten’d with Water; this they hang
 “ upon a Branch of the *Pistacia Fœmina*,
 “ where they suffer it to remain until the
 “ Flowers are blown, the *Apices* have burst,
 “ and the Dust is shed, and blown by the Wind
 “ over all the *Pistacia Fœmina*. By this
 “ Means the Fruit of the *Pistacia Fœmina* is
 “ impregnated and begins to swell. “ The

“ The *Pistacium Mas* flowers before the
 “ *Fæmina*. There is another way of fecun-
 “ dating the *Embryones* of the *Fæmina*. They
 “ take the Buds of the Flowers of the *Mas*,
 “ and put them in a Bag of thin Lawn, and
 “ when they are dry they dust over all the
 “ Female Tree with the *Powder* or *Farina*
 “ from this Bag. ’Tis necessary to take the
 “ Flowers before they are blown, for they
 “ very soon shed the Dust, which is of a yel-
 “ low Colour. The Peasants use to try this
 “ Experiment, by taking a little of this Dust
 “ of the Male-Flowers, and laying it upon
 “ the *Embryones* of the *Fæmina*, they ob-
 “ serve shortly thereafter, that they begin to
 “ swell as a Woman uses to conceive after
 “ she has been impregnated by a Man.

“ It is observ’d, that if the Male Dust is
 “ shed before the Female begins to germinate
 “ or bud, in this Case the Fruit shall not fill,
 “ but be ready to abort and miscarry, there-
 “ fore they provide themselves with the dry’d
 “ *Male-Flowers*, that they may dust the
 “ Fruit over, and dispose it to encrease and
 “ ripen.

“ When there are a great many Male and
 “ Female-Trees together, they are not so
 “ careful to preserve the Male-Flowers, be-
 “ cause the Dust is blown by the Wind, and
 “ communicates the *prolifick Virtue* to the
 “ Fruit upon the Female Tree of its own ac-
 “ cord.

“ They

“ They are so careful over all *Sicily* to provide themselves with the Male-Flowers, and so exact in their Observation, that they know when such Branches of the Female-Tree have been dusted over with the *Farina*, for then they will produce Fruit abundantly ; and if any of the Branches seem to fail in the Fructification, then they strew them over with the Dust.

By this Account, which may be seen at large in *Boccone*^a, it appears he is of the Opinion, that the *Effluvia* from the *Farina*, impregnates the Seed, as well as *Dillenius* and the several fore-mentioned Authors.

To be added to Mr. Fairchild's Experiment of the Circumcision, p. 391. l. 20.

If only an Inch of this Bark is taken off in the Month of *May*, against the latter end of *August*, the Bark shall encrease downwards, and join with the lower part of the Incision. In that Case it shall put forth Wood-Shoots next Year ; but it shall still continue to fructify more plentifully until the whole Incision is supply'd with Bark ; but if the Incision is three or four Inches long, then the Bark do's not so readily join. This shews that the Bark has distinct nourishing Vessels from the

^a *Boccone Museo di Fisica & di esperienze variato, & decorato di Osservazioni Naturali. Osservazione quarentesima quarta, p. 282. Museo di piante rare della Sicilia, Malta, &c. p. 139. Edit. Venet. 1697.*

Wood, and that the Sap descends as well as ascends by the Bark. 2. He made an Experiment by topping of Fruit-Trees thus: He chose two young Pear-Trees of the same Soil, and of an equal Growth; he topp'd the one in *September* by taking off several of the Vernal and Autumnal Shoots of that Year. The other he topp'd in the Spring following; and that which he topp'd in the Spring, push'd forth longer Shoots than that which he top'd in the Autumn, by which it appears that the Sap took another Course in the Autumn, and was bestow'd upon the Nourishment of the Bark, so that it did not so soon ascend in a direct Line as that which was topp'd in the Spring, when the Sap had not been diverted from its direct Ascent and Descent during the Winter.

F I N I S.



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